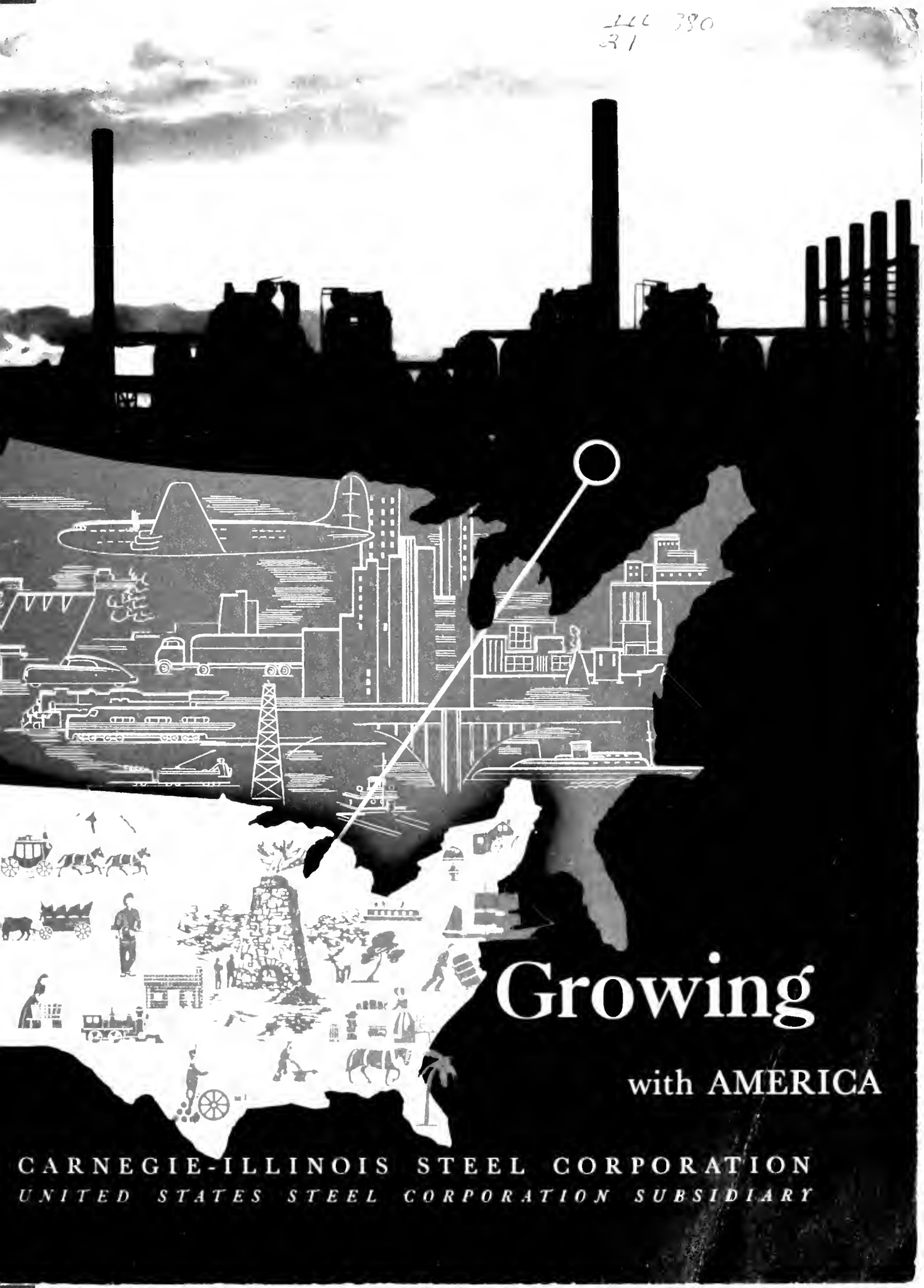


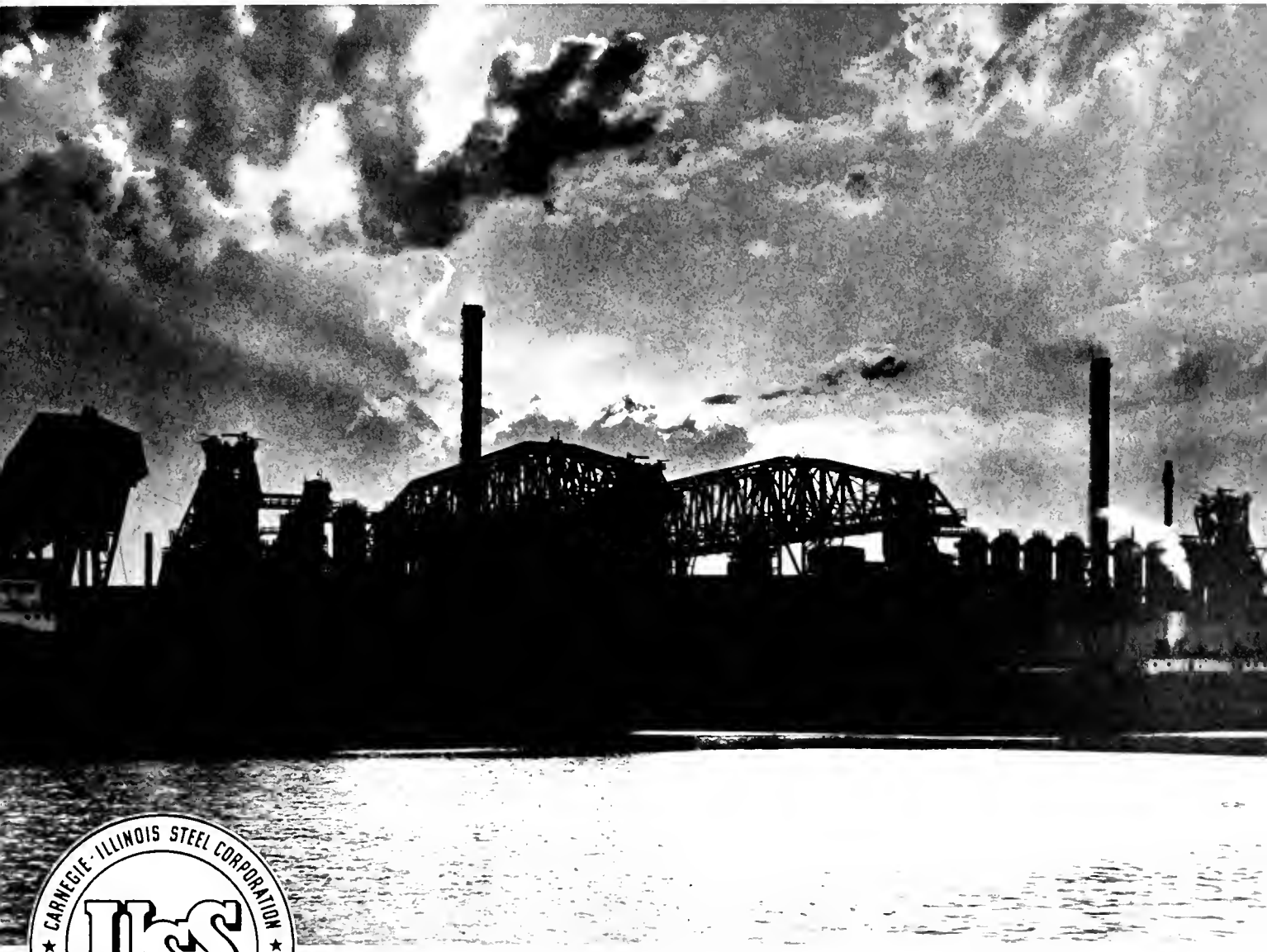
Growing

with AMERICA

CARNEGIE-ILLINOIS STEEL CORPORATION

UNITED STATES STEEL CORPORATION SUBSIDIARY

GROWING with AMERICA



CARNEGIE-ILLINOIS STEEL CORPORATION
USS
UNITED STATES STEEL

DEDICATION

THIS BOOK *is the story of how Carnegie-Illinois Steel Corporation has grown with America.*

The concepts that have made America great are also the concepts upon which this largest subsidiary of United States Steel Corporation has been built. These concepts play a major part in the relationship between the company and its employees, as well as in the relationship of the company with its customers who fashion steel into the products necessary to build and maintain our modern civilization.

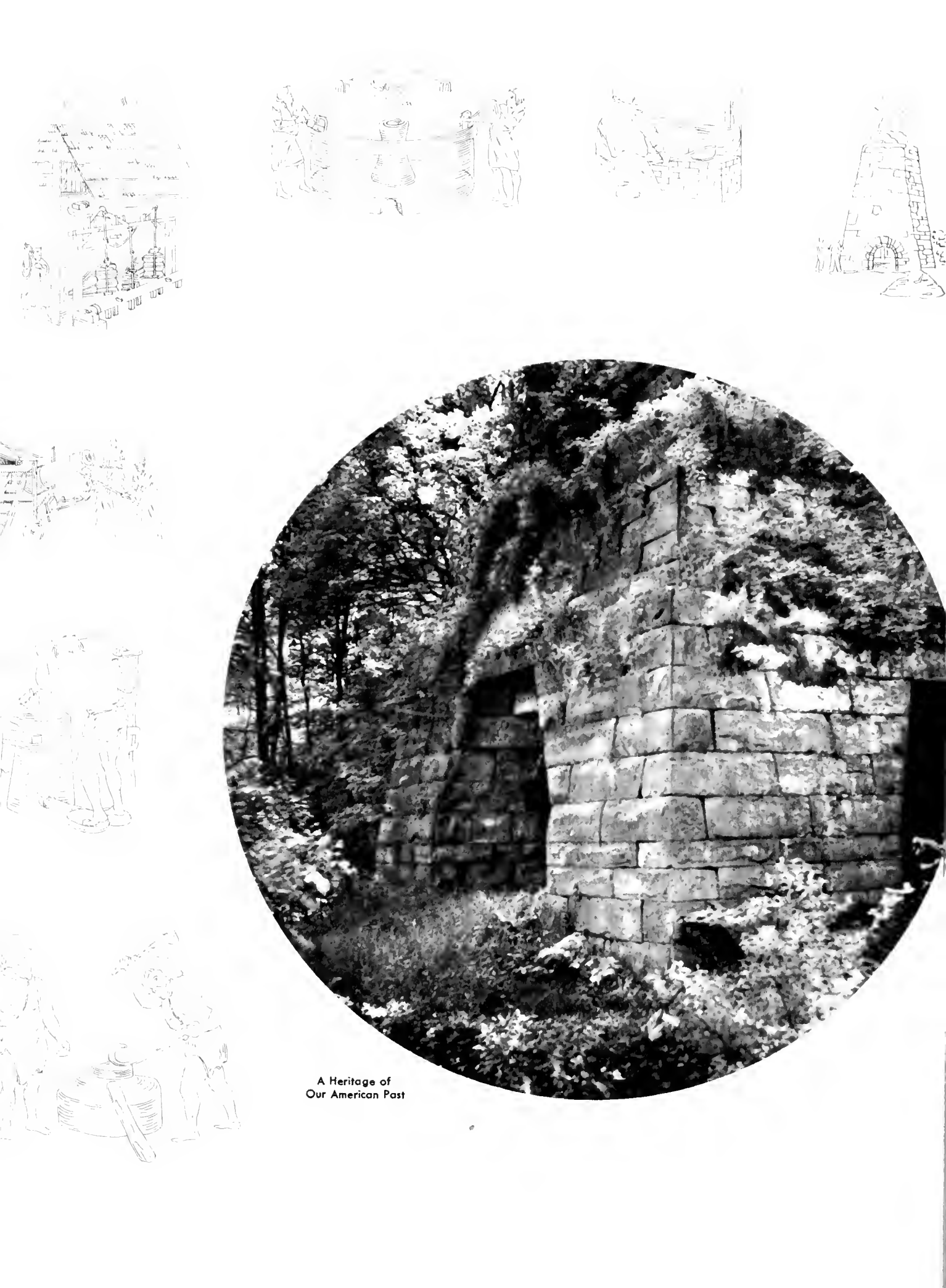
To all who believe that in serving America they can best achieve their destiny, we respectfully dedicate this book.

GROWING with AMERICA

THE reasons behind the growth of Carnegie-Illinois Steel Corporation may be lost sight of in the scope of its activities, but this very scope is an indication of the soundness of its main objective—a high standard of service to the nation. This has been the foundation of our policy in the past. Upon it we have developed our resources—personnel, equipment and materials. It is upon this foundation that we base our future.

For America's future is also the future of United States Steel. We intend to contribute to and share in that future as we have in the past.

In the pages of this book you may learn how we shared in the development of America. You will see the present methods and techniques that we use in the making, shaping and treating of steel. You will meet the people of Carnegie-Illinois who are a vital factor in these processes. And out of this we hope will come the understanding of why we in Carnegie-Illinois face the future with faith, vigor and courage. . .



A Heritage of
Our American Past

HOW WE GREW

SOME DAY when you are driving through the countryside of Pennsylvania, Ohio, Indiana or Illinois, your road may run beside an isolated pile of moss-covered stone. It might be an abandoned springhouse, fallen into decay, or the corner of an old fort or barricade—relics of America's past. Or, those stones may be the remains of an old stone furnace.

Later on that day, your trip may take you through one of the cities in which Carnegie-Illinois has built its plants. And a comparison of those plants with the small pile of stone that was their forerunner shows how far we have come from the pioneer days of the iron men to the present steelmaking facilities of modern America.

We began in the embers of a small forge established in 1858 at Girty's Run in Millvale, Pennsylvania, upriver on the Allegheny from Pittsburgh, and grew because a young man in Pittsburgh visualized the nation's need for a metal of strength and permanence that would be able to match the nation's growing plans.

That man was Andrew Carnegie.

As a young man who had already made an enviable record in railroading and was casting about for a new and challenging field, what did Andrew Carnegie see in the early 1860's? He saw a nation caught in a fierce and terrible war that was, however, beginning to reach its weary end under the patient guidance of Abraham Lincoln. He saw a nation which stretched across a continent and which was already becoming conscious of the great and influential strength it was to wield in the world. Yet the sinews of young America were being supplied with only a trickle of iron from hundreds of small furnaces and forges whose limited capacities struggled to keep up with the demand. So great was that demand that a noted European firm was saved from bankruptcy on one occasion simply by orders for iron rails from the United States.

The nation needed a constant source of the many forms of iron necessary for its expansion. Realizing this, Carnegie formed a partnership to buy the Keystone Bridge Company, and invested in the Iron City Forge of the Kloman Brothers of Pittsburgh, whose shop was inventoried at "one steam engine, two hammers, one furnace and sundry tools and merchandise."

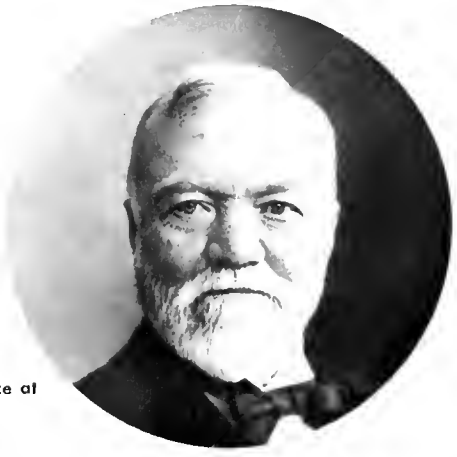
That was the start—a good start, too. Up to this time, pig iron was sold to the growing Carnegie interests by independent blast furnace operators. But more iron was needed, and to secure an adequate and independent supply the decision was made to build a new blast furnace, the *Lucy*, named after the wife of Carnegie's brother, Thomas. In 1872, the *Lucy* furnace was "blown in," across the Allegheny river from the *Isabella* owned by other Pittsburgh iron men. Soon the two were involved in a friendly but intense rivalry over pig iron production. Little by little, daily production climbed, with the record passing back and forth across the river. One brisk October day in 1875, the *Lucy* awed the country by smelting over 100 tons for a new daily record.

The Carnegie Company mills already had more orders for iron than they could handle. But on one of his trips to England, the need of his young country for a strong, new metal that could be inexpensively produced in quantity was in Andrew Carnegie's mind. He saw steel rails, produced by a new method that Sir Henry Bessemer had developed, giving amazingly good service to England's railroads. When he returned from one of these trips, his decision was made. There would be a Bessemer mill and it would have to be big. It would need good men to run it.

The site for the new mill was the old battlefield where General Braddock had been defeated in the French and Indian Wars, up the Monongahela River from Pittsburgh. So convinced of its necessity were the builders of the mill that construction was pushed through the business decline of 1873. When completed, it was the largest mill of its kind in the world and ready for the job of rolling steel rails for American railroads. It bore the name of a famed and contemporary railroad man, Edgar Thomson. It was headed by one of the best mill men in America's history, thirty-four-year-old William Jones, an ex-captain of the Civil War.

The first Bessemer blow was made on August 26, 1875. On September 1 of the same year, the first rail was rolled. At the Centennial Exposition in Philadelphia one year later, a 62-pound rail, 12 feet in length, produced in this mill, was exhibited. It was the largest and heaviest steel rail ever produced up to that time and it set the pattern for rail development in the United States and the study of steel from which new uses were to emerge.

In steelmaking, Captain Jones was an artist. Through his inventiveness and mechanical genius, he improved almost everything he touched. For example, to speed production and improve quality, he invented the Jones Mixer, a huge iron pot for mixing and storing molten pig iron. He drove himself hard, and his men followed. Perhaps these words which he wrote one day in a letter to a friend will show



Andrew Carnegie and his birthplace at Dunfermline, Scotland.

Captain William Jones, and the Edgar Thamson Steel Works in 1875.

why he was the most admired and respected mill superintendent of his generation: "*The men should be made to feel that the company is interested in their welfare. Make the Works a pleasant place for them. I have always found it best to treat men well and I find that my men are anxious to retain my good will by working steadily and honestly, and instead of dodging, are anxious to show what a good day's work they have done.*"

From the beginning, the Edgar Thomson Plant was a pace-setter. In four months, Captain Bill Jones and his men doubled all previous production records for plants of comparative capacity. When a paper written by him was read before the British Iron and Steel Institute in 1881, the figures in it were greeted with incredulity on the part of the British steelmakers. For in it, Jones calmly announced that America was now the world's leading producer of Bessemer steel.

But America was growing fast. Our country's young hunger for the versatile metal was insatiable. On the farms, new steel harvesting and reaping machinery was supplanting older equipment. Railroads were spinning webs across the country; towns and villages were growing into cities, thrusting steel fingers into the sky. To meet this surging demand, the Pittsburgh Bessemer Steel Company was organized and a plant was constructed at Homestead, Pennsylvania. In October of 1883, in order to integrate operations for greater efficiency, this plant was absorbed by the Carnegie interests. A new row of Bessemers was installed, and an open hearth furnace—the latest evolution of the Siemens Gas Furnace—was put in production.

A year before, the Carnegie mills had begun to use Connellsville coke produced by Henry Clay Frick. Later, Frick was brought into the company; first for his undeniable executive abilities and second for his thorough comprehension of the company's purpose—the integration of operations for greater and greater production at less and less cost to the consumer. Interests were secured in the Mesabi Range in Minnesota, which guaranteed controlled delivery of better ores. Steamboats were acquired to carry the ore from Duluth to the ore ports of Lake Erie. A railroad line (The Bessemer and Lake Erie), running from Conneaut to Pittsburgh, was secured and modernized.

Pursuing its policy of expansion, the company purchased the Duquesne Steel Plant from the Allegheny Bessemer Steel Company in 1890. Additional furnaces were added at Edgar Thomson Works, and the Carrie Furnaces were acquired from the Fownes Brothers in 1898, the same year the Union Railroad—an inter-plant connecting line—was completed.

In three short decades steel had come of age. The men of Carnegie had taken the fragments of a sprawling industry, each producing a limited number of specialties from horseshoes to cable for the basket ferry—the newest thing at Niagara Falls—and molded them into a new and vital force in American life that was to serve as a large factor in the nation's expansion into a world power.

And finally, they emphasized that growth into greatness can best be accomplished through service.

THE CHICAGO STORY

The second oldest of the original plants of today's Carnegie-Illinois Steel Corporation, the North Chicago Rolling Mill Company, was established by Captain Eber B. Ward and some Boston associates on the north bank of the Chicago River. The discovery of the immense iron ore deposits of the Lake Superior region in 1844, and the opening of the Sault Canal, signalized the start of the new industry in Chicago. A "natural" steel man, Ward had installed an experimental Bessemer converter at Wyandotte, Michigan, as early as 1855, foreseeing the day when steel would supplant iron as the backbone of America. Bessemer steel rails were rolled for the first time in America by Ward in mid-spring of 1865. Fifteen years later dependence upon Pittsburgh for pig iron was eliminated by the construction of two blast furnaces. In 1890, various steel mills in Chicago, Milwaukee and Joliet were merged to form the Illinois

Steel Company, which could line up fifteen blast furnaces, nine Bessemer converters and excellent accessory manufacturing and transportation facilities. The South Works of the company found a waiting market almost next door in the many fabricating and manufacturing industries in Chicago, and the Joliet Works, a little farther inland, added an excellent rod mill to the facilities.

Chicago, metropolis of the midwest, was ready to serve its own area with its own steel, produced entirely in its own mills.

Although steel was not poured in the Mahoning Valley near Youngstown, Ohio, until 1895, the area had contributed iron products to the country's economy for some time previous to that date. The Upper Union mills, oldest of the three plants of Carnegie-Illinois in the Youngstown district, originally included a puddle mill of thirty furnaces from which the first puddle bar was made in 1874. Around the turn of the century, after passing through several ownerships, the plant included an 8-inch mill, a 10-inch hoop mill, and a 10-inch continuous mill for rolling cotton tie and hoop. The Ohio Works, formed in 1892, had extensive facilities for making steel, and by 1900 two blast furnaces had been built to guarantee a constant supply of pig iron.

THE TWENTIETH CENTURY

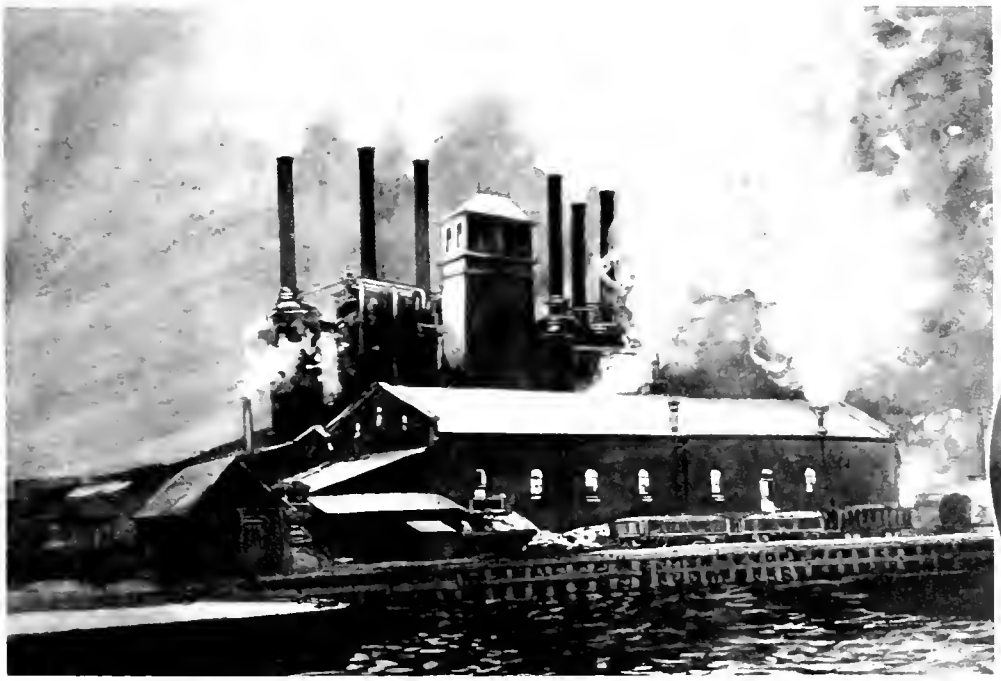
At the century's turn, it was evident that a new pattern of industry was being drawn for the United States. Mass production, made necessary by ever-widening markets, required the use of larger and more expensive manufacturing equipment. Because of financial demands involved in this operation many companies found it desirable to consolidate into larger organizations, with a greater portion of the public participating in the ownership. It was an industrial evolution.

About this time, Judge Elbert H. Gary, an Illinois lawyer with an enviable background of faithful civic service, was becoming recognized as a leader and authority in corporation matters. During the last decade of the nineteenth century, his reputation for integrity and fair dealing created a great demand for his services by many of the new corporations which were formed at this time. He was quick to see the advantages of the new industrial trend and in 1898 gave up the practice of law to organize the Federal Steel Company and to act as its president.

He realized that steel, which requires enormous investments in producing equipment, could effect maximum economies only through maximum integration. These economies would be obtained through greater stabilization of the industry and manifested in lowered costs to the manufacturers, the builders, and the people of America. And out of the realization of this concept, the United States Steel Corporation was formed, with Judge Gary at the helm.

Incorporated on April 1, 1901, the new Corporation's capacity for service in its initial year was significant: 149 steel works, 78 blast furnaces, 500,000 acres of coking coal lands, more than 1,000 miles of railroads, large ore properties, both developed and undeveloped, and a host of other resources.

The Carnegie and Illinois Companies, which were the largest producing units of the new industrial family that serves the nation, continued to add to their facilities. From time to time, new plants were constructed or purchased. The greatest of these was launched in 1906—the steel works at Gary, Indiana—an "engineer's dream" which balanced the distribution of steel facilities between the East and the Midwest. The year 1916 saw the beginning of what was to grow into the world's largest coke and coal chemicals works at Clairton, Pennsylvania, on the site of a plant which had been purchased by the United States Steel Corporation and leased to the Carnegie Steel Company in 1904.



North Chicogo Rolling Mills in 1889.

Captain Eber B. Ward

Also, in 1916, ground was broken on the south bank of the Mahoning River between Girard and Niles for the McDonald Mills, which were to give the Carnegie Steel Company merchant and bar mill facilities in the Youngstown district. Additional facilities purchased by the corporation included the other Mahoning Valley mills and plants which, with McDonald, now make up the Youngstown district of Carnegie-Illinois. And to complete the circle of integration to include numerous finished steel items that could be produced only in a shop specially designed for the purpose, the Lorain Steel Company, with its foundries, pattern shop and other specialty equipment at Johnstown, Pennsylvania, was made a part of the organization.

The new corporation dramatically proved in World War I the value to the nation of coordinated integration in steelmaking. Three of its major subsidiaries, the Carnegie Steel Company, the Illinois Steel Company and the American Sheet and Tin Plate Company, demonstrated that they could also meet the quick demands of war. At Gary was erected a gun-forging plant for field pieces and howitzers. The Schoen Plant of Carnegie added shell-forging equipment, as did Homestead, which also built in record time the famed 110-inch mill for battleship plate.

After the war's end, the steelmaking units which now form Carnegie-Illinois converted quickly to peacetime production. Research—which dated back to the day when the Carnegie partners had hired a chemist to watch over the queasy rumblings of the *Lucy* furnace—was intensified in the development of new processes and grades of steel. A "Safety, Sanitation and Welfare" program for employees, originated by Judge Gary in 1906, was instrumental for reducing accidents to the minimum, a program which has evolved to make Carnegie-Illinois one of the safest companies of our country's heavy industries in which to work. Based on the best available techniques, special training programs were inaugurated which are now an integral part of our employee-development program.

On October 1, 1935, Carnegie Steel Company, the Illinois Steel Company and the Lorain Steel Company were combined to form the Carnegie-Illinois Steel Corporation. Eight months later, the American Sheet and Tin Plate Company was also made a part of this organization.

The responsibility of producing one-seventh of the world's steel was now represented by Carnegie-Illinois Steel Corporation, backed by the specialized knowledge and skills of over 100,000 employees.

When Japan attacked America at Pearl Harbor, lend lease had taken most of our meager supply of war goods. Even with the steel capacity of the United States, much greater production was needed if our nation were to overtake her enemies in the manufacture of war materials. That meant steel—in quantities unheard of—enough for our own rapidly growing armed forces and auxiliaries, as well as those of our allies.

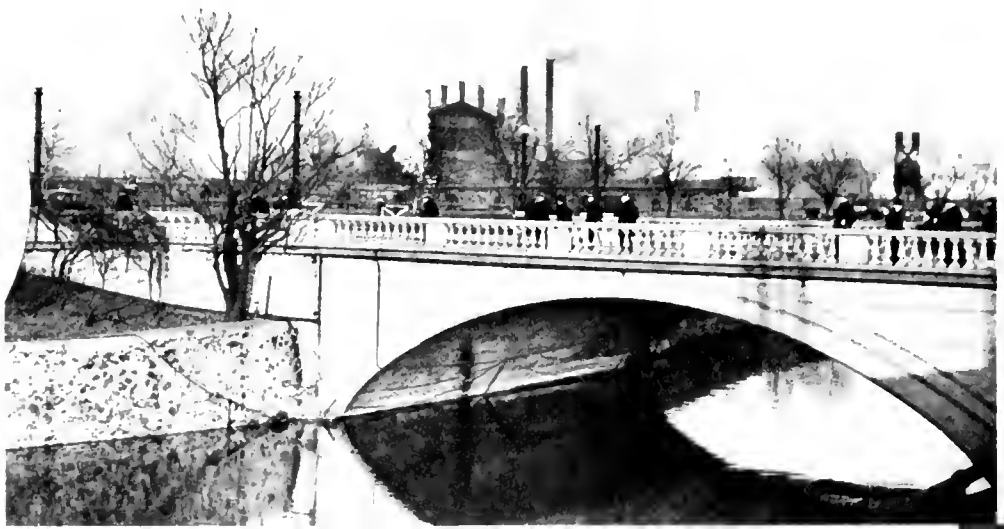
The men and women of Carnegie-Illinois Steel Corporation united in one grim purpose. Through the utmost utilization of our vast existing facilities and an expansion program unparalleled in industrial history, as well as conversion of many units to wartime production, we tackled the job. The facts tell the story. During the wartime period, we produced 83 million tons of steel ingots and castings. From the coal chemical plants came a half billion gallons of coal tar, 22 million gallons of toluol for TNT, 90 million gallons of benzol, essential in synthetic rubber manufacture, and 100 million tons of ammonium sulphate, an excellent nitrogenous fertilizer, to enrich the nation's farms and victory gardens. Developed by the company was the now famous air-landing mat that was called by General H.H. Arnold the "outstanding development in aviation in 1942." Our company produced 90 per cent of all manganese steel for Army and Navy helmets in this war. Ship plate, tinplate, tank and battleship armor, heavy castings, firearm steel, main drive shafts—all were produced in the mills of Carnegie-Illinois Steel Corporation in prodigious quantities.

Forty-five thousand of our men and women entered the armed forces, and as in previous national emergencies, the government drew heavily on the services of many key employees to fill important posts for the duration. Thousands of our personnel volunteered for home defense and freely gave of their spare hours to wartime organizations.

Carnegie-Illinois Steel Corporation of United States Steel, in keeping with its traditions of nearly a century, again gave service to the nation by helping to preserve the heritage of the past, the achievements of the present, the promise of the future—through victory in World War II.

Bridge Over the Calumet River, Gary Steel Works, Gary, Indiana.

Henry Clay Frick



HOW WE MAKE STEEL

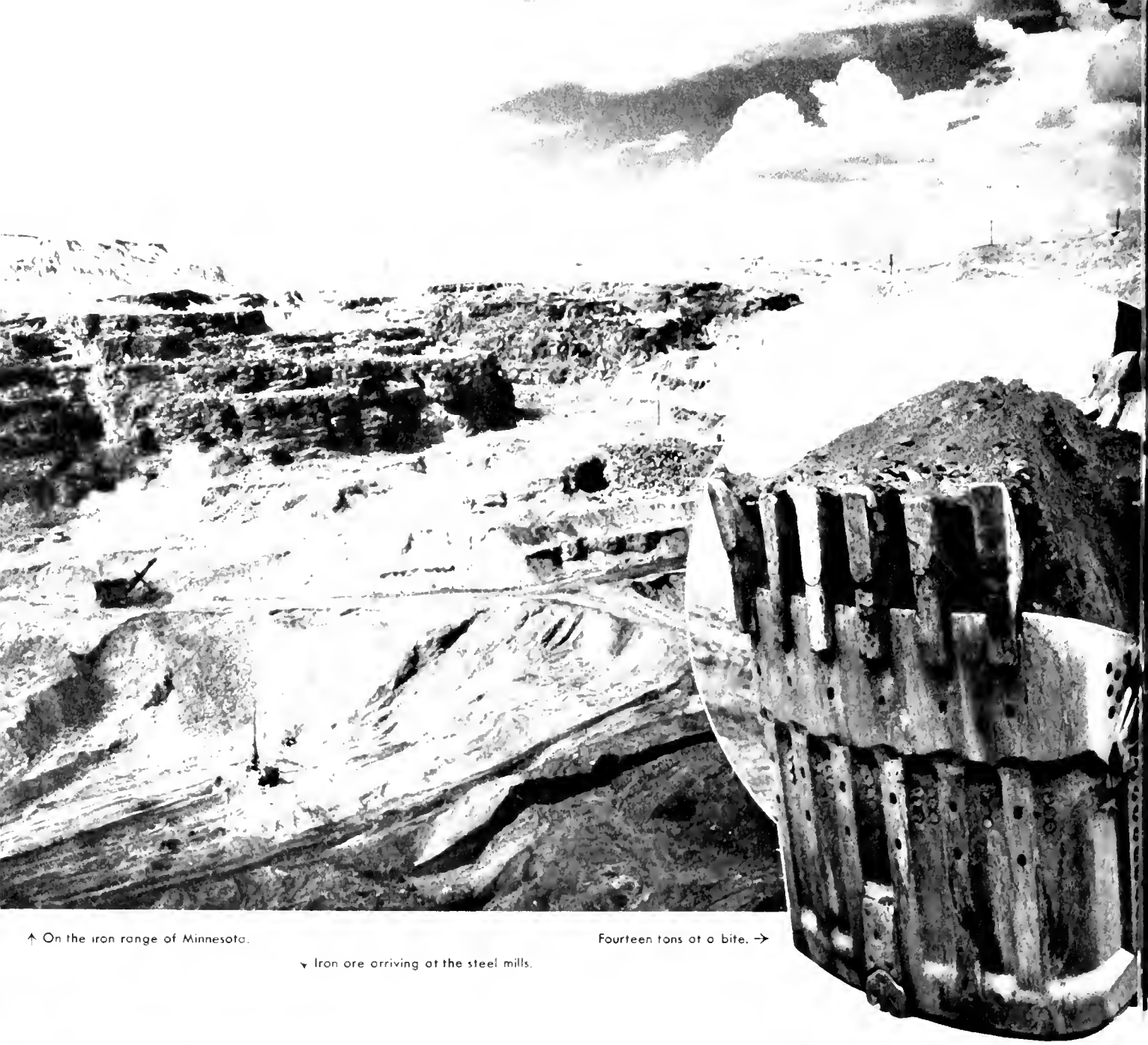
STEEL, in its manifold forms and applications, cannot be defined as a product; it is a wide variety of products of infinite variations in composition, with purified iron as its basic ingredient. To grasp the many details of technique, engineering and metallurgy that are needed to supply today's diversified market requires years of study and experience. For a layman to understand only the fundamentals of basic processes in steelmaking, a good method would be for him to visit the various mills of Carnegie-Illinois. In this way, he could see for himself the array of talent, equipment, teamwork and knowledge that contributes to the steel industry's massive vitality.

What would he remember? There might be many things: the sheets of stainless steel at Wood Works; the strip steel at Irvin slithering down the runout table to the coilers; or cold-reduced silicon steel flowing through the 54-inch mill at Vandergrift. It might be the crackling flash of the electric furnaces at Duquesne and South Chicago, or the welter of undertones and light at Homestead when the open hearths are tapped. It may be that he would remember the light wisps of orange-colored smoke rising lazily from the tall stacks of Edgar Thomson, or the roar of the blast furnaces at Gary. He might recall the operations at Clairton, Gary, and Joliet when the coke fell from the ovens like incandescent Niagaras into the quenching cars. He would remember the delicate techniques of the mold-makers of Johnstown; the timing of the bar mill men at Upper Union and McDonald, or the teamwork of the Wheel and Axle crews at McKees Rocks.

Perhaps he would retain the memory of the Bessemers at South Works, erupting thirty foot jets of flame, or the Ohio Works, where he had heard the crop-ends of hot slabs bumping down onto the conveyor. He would picture again the finished rolls at Canton, gleaming in the afternoon sun, or perhaps ferro manganese, cooling in the casting beds at Isabella.

He might conceivably miss the quiet, efficient background of managerial, engineering and clerical forces in mills and offices—planning, scheduling, recording and reporting so that the wide-spread activities might have unity and singleness of purpose. But whatever details he remembered, they would not give the complete picture of the immensity of the industry that has built and maintained our modern civilization.

It is for this reason that this section of "Growing With America" has been prepared to give you a progressive—if rapid—picture of the diversities of steelmaking from the ore pits of the Mesabi to the steel shapes and forms that give service to America today.

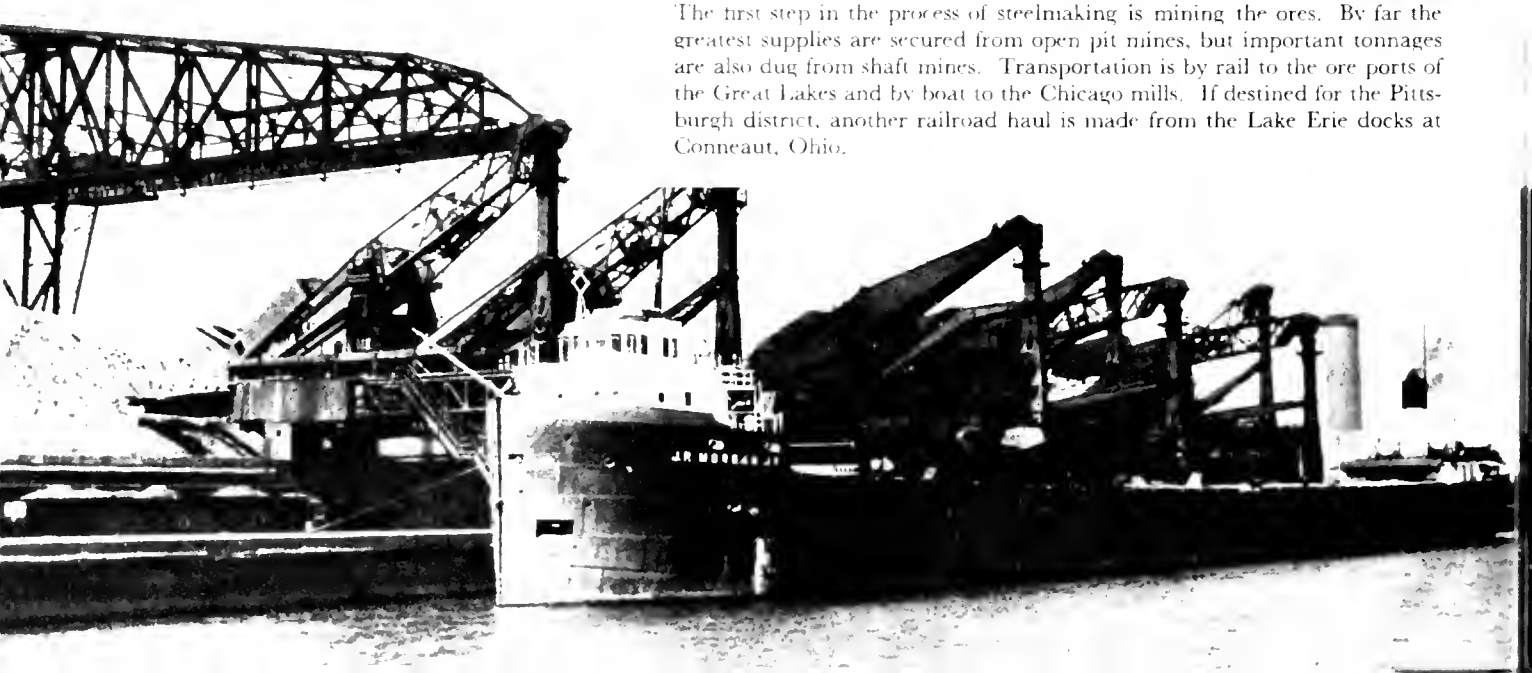


↑ On the iron range of Minnesota.

Fourteen tons at a bite. →

↓ Iron ore arriving at the steel mills.

The first step in the process of steelmaking is mining the ores. By far the greatest supplies are secured from open pit mines, but important tonnages are also dug from shaft mines. Transportation is by rail to the ore ports of the Great Lakes and by boat to the Chicago mills. If destined for the Pittsburgh district, another railroad haul is made from the Lake Erie docks at Conneaut, Ohio.

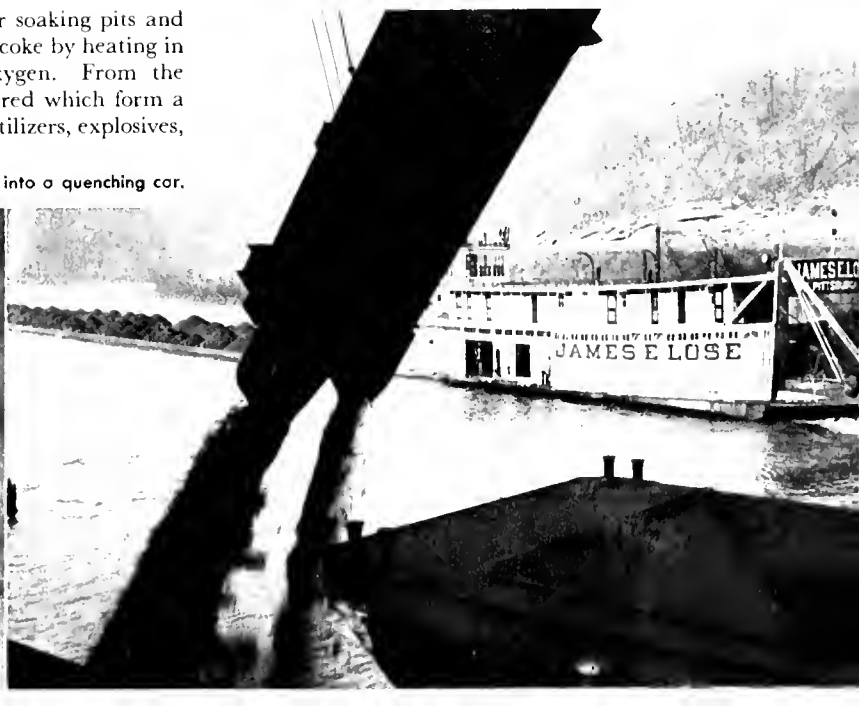


↑ A modern coal chemicals plant.

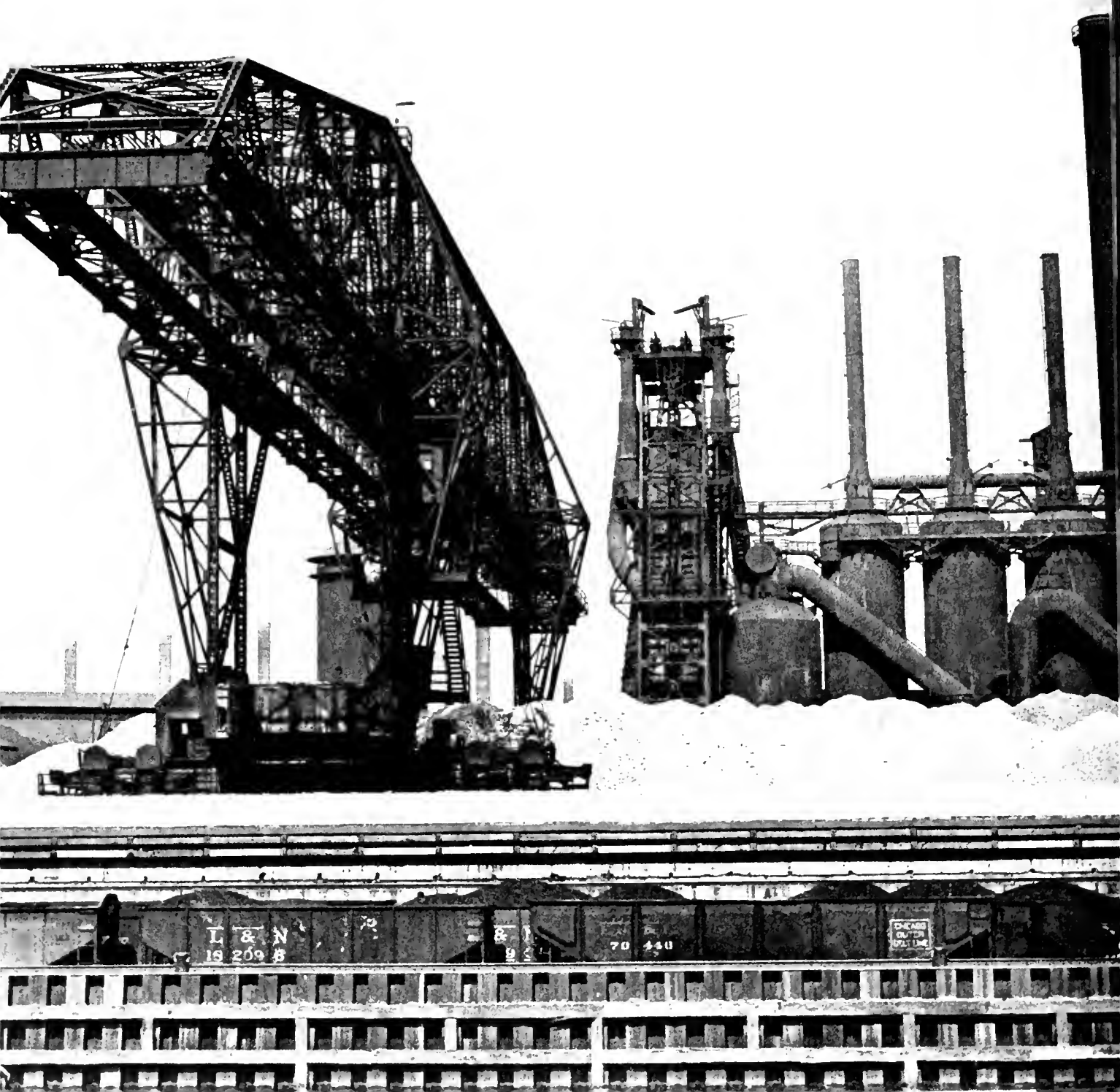
↓ Our fleet of river boats hauls coal to the ovens.

King Coal furnishes coke for smelting ore, and gases for soaking pits and heating furnaces. In the coke ovens, coal is changed into coke by heating in an atmosphere containing a restricted amount of oxygen. From the liberated gas and tar, various coal chemicals are recovered which form a basis for an almost limitless list of drugs, dyes, plastics, fertilizers, explosives, synthetic rubber, and other products.

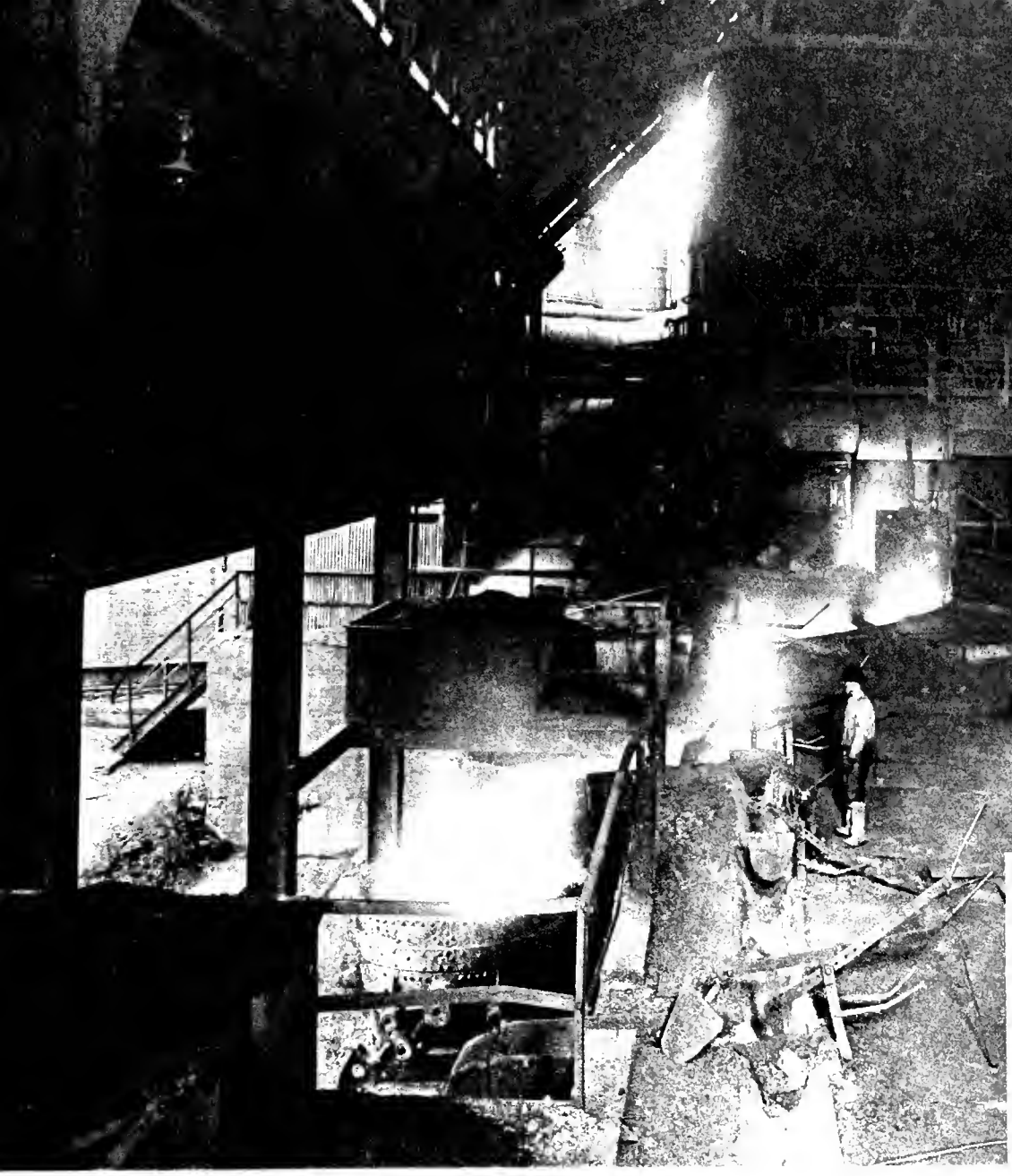
↓ Pushing hot coke into a quenching car.

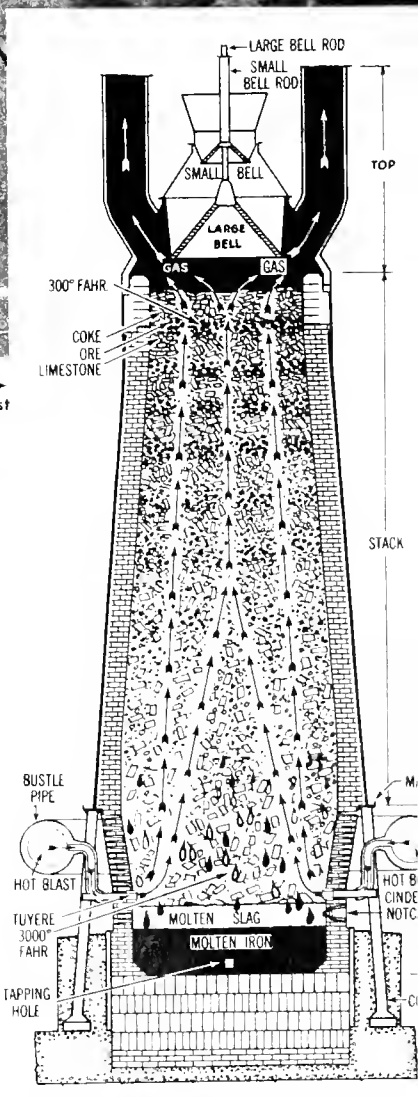


Ore bridges on huge steel legs straddle the row materials in the stock piles. Stocked according to grade, these materials may be selected quickly by the bridge operators according to the specifications required at the blast furnaces.



↑ Iron at 2600 degrees Fahrenheit flows into the ladles.





→ Schematic diagram of modern blast furnace in operation.

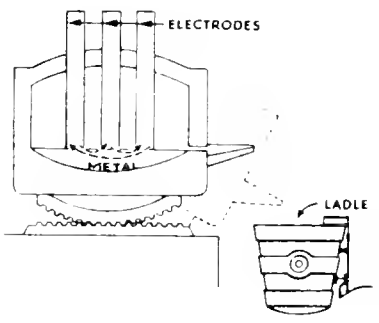
↓ Taking a sample of iron for analysis.

Blast furnaces are huge, steel-jacketed, brick-lined towers in which many of the impurities in iron ore are separated from the molten iron. Varying charges of ore, limestone, and coke are fed into the furnaces through the top. Heated air, in combination with the coke, produces the heat and reducing agents necessary for smelting the charged materials into iron, while limestone, acting as a flux, carries impurities away in the form of molten slag.

↑ Adding titanium to a heat of 18-8 titanium stainless, stabilized steel.

From the interior of the electric furnaces come stainless steels and many other high-quality precision steels that have found such a multitude of uses in recent years. Electric current, released from carbon electrodes that are lowered from the top of the furnace, furnishes heat that can be exactly controlled in the high ranges necessary in the production of such steel.

→ Diagram of an electric furnace.



← Stainless steel flowing from the hearth of an electric furnace.

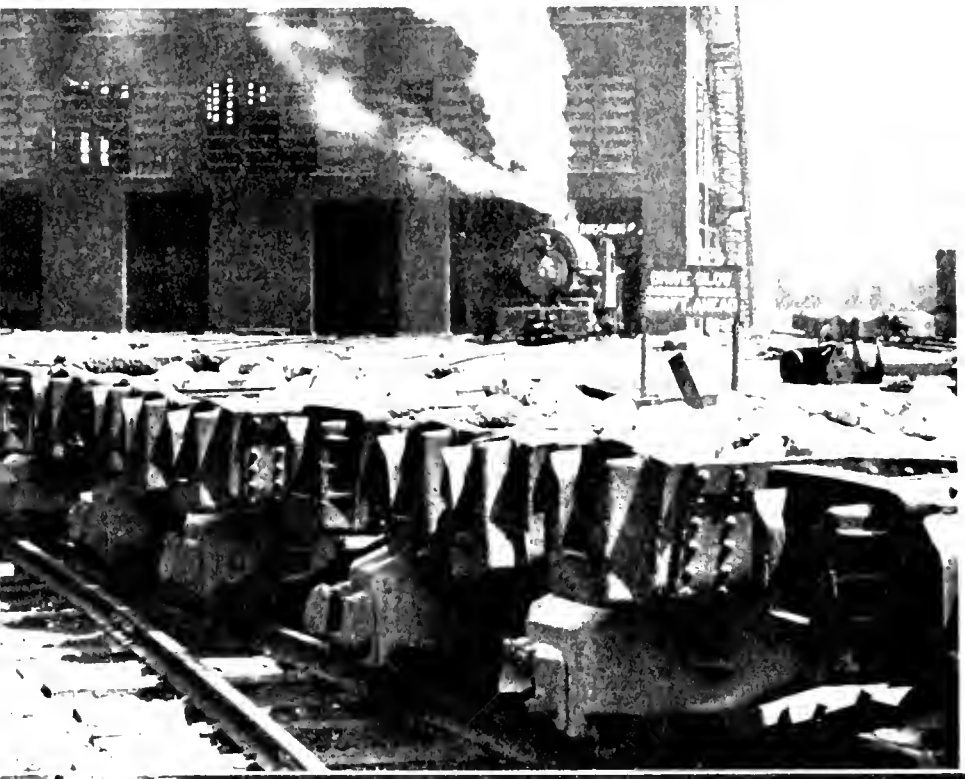
One of the oldest and most spectacular of all the present processes employed in steel-making is the Bessemer process. A blast of air is blown through the molten iron, and elements such as carbon and silicon are oxidized in the intense heat that is generated.

Modern converters can produce about 25 tons of steel in as many minutes in a single "blow."

Diagram of a Bessemer converter.

↑ The charging side of open hearth furnaces with small stock piles of material ready for use.

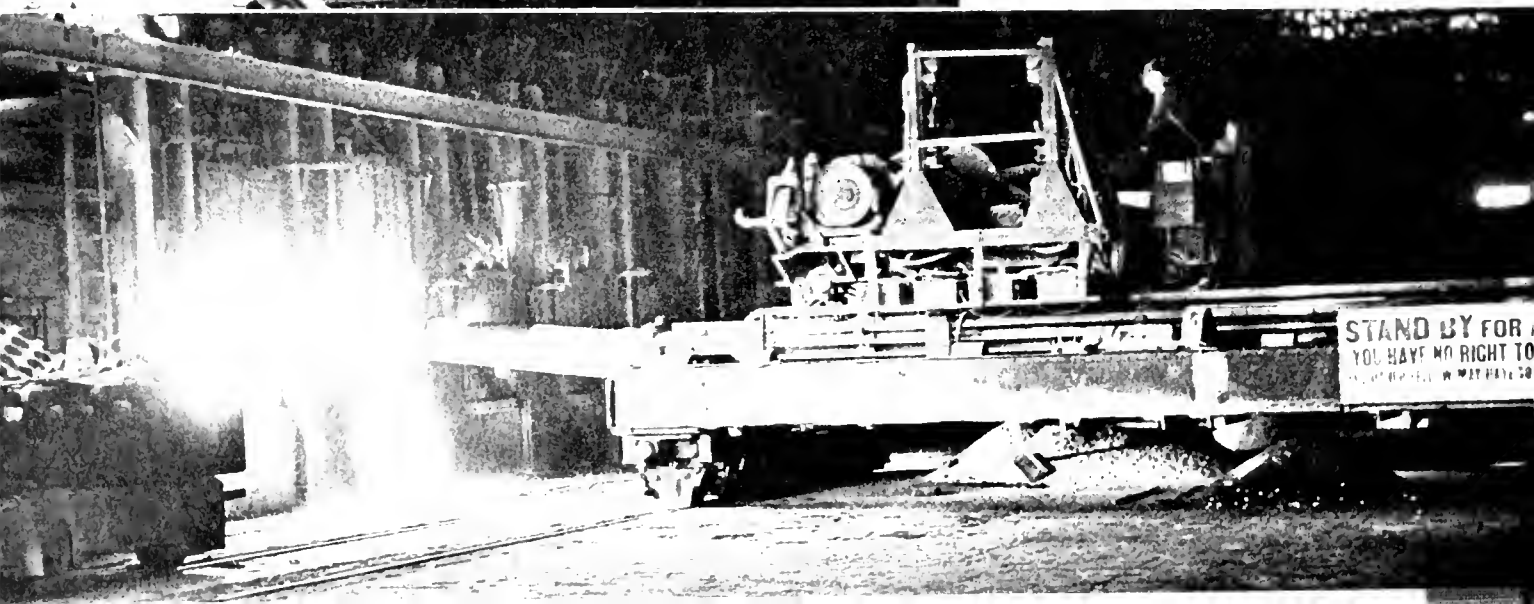
↓ Charging boxes may be filled with ore, limestone, or scrap.



All steels contain carbon and manganese, regardless of whatever other alloying ingredients are used. In the open hearth process, the undesirable elements in pig iron are removed and certain alloying ingredients are added. The open hearth furnaces are charged in the following sequence: limestone, iron ore, steel scrap, and—later in the process—molten pig iron. Where molten pig iron, or "hot metal" is not available, the practice is much the same, except that a 100% cold charge is used. Heat is produced by burning, at alternate ends of the furnace, gas, oil, or other suitable fuels above the level of the charged material. Mixed with the fuel is air, preheated in checker chambers which are an integral part of the open hearth furnace.

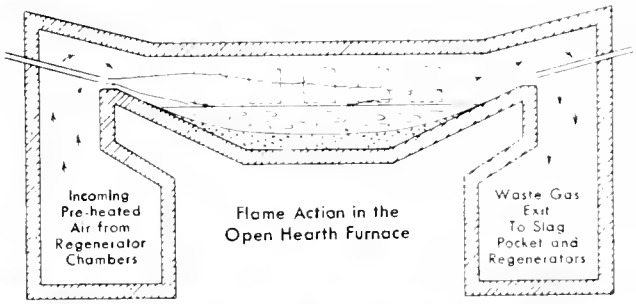
When the charge melts, many of the impurities float to the surface in combination with limestone to form slag, while other impurities pass off in the form of gas. Temperatures are closely controlled during the entire process, and measured quantities of various elements are added to give steel the properties desired by the customer.

↓ The charging machine—work horse of the open hearth—charging a box of scrap.



↑ A close-up of molten pig iron entering the furnace.

"The requirements of the countless users of steel are so varied that steel must truly be tailor-made, and the last hour in the furnace is the climax of the melter's efforts to insure that the composition of the heat meets the particular specification. So rigid are these specifications that if housewives had to make cakes with the same relative care which the steel men must use, they would have to measure the ingredients of their cakes, not by teaspoonfuls, but by ten-thousandths of an ounce." *From "The Picture Story of Steel," published by the American Iron and Steel Institute.*



↓ Deoxidizing a test mold with aluminum wire preparatory to laboratory analysis.

↑ Ramming out the plug in tapping an open hearth.

← A first helper checks the progress of a heat.

CROSS SECTION OF MODERN OPEN HEARTH FACILITIES

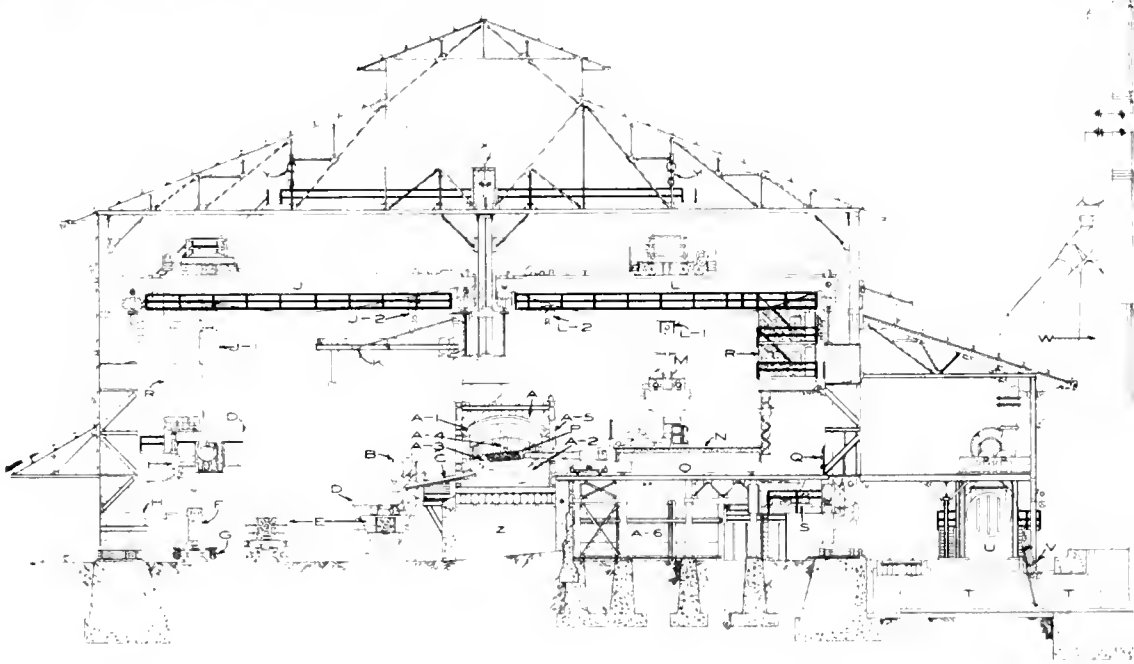
DETAILS

A OPEN HEARTH FURNACE
- A-1 ROOF
- A-2 HEARTH
- A-3 BATH
- A-4 BURNER
- A-5 DOOR
- A-6 CHECKER CHAMBER

B LADLE ADDITION CHUTE
C SPOUT
D STEEL LADLE
E SLAG THIMBLE
F INGOT MOLD
G INGOT BUGGY
H POURING PLATFORM
I STOPPER ROD ASSEMBLY
J POURING LADLE CRANE
- J-1 MAIN HOIST
- J-2 AUXILIARY HOIST

K SPOUT CRANE
L HOT METAL CRANE
- L-1 MAIN HOIST
- L-2 AUXILIARY HOIST

M HOT METAL LADLE
N CHARGING MACHINE
O CHARGING FLOOR
P CHARGING BOX
Q CONTROL PANEL
R CRANE CAB
S ELECTRIC VALVE HOIST
T DUCT
U WASTE HEAT BOILER
V STACK DAMPER
W STACK
X ELECTRIC DOOR HOIST
Y REPAIR HOIST
Z SLAG POCKET



A big sight in steel—
tapping the open hearth.

↑ Steel assumes its first solid shape in the ingot mold.

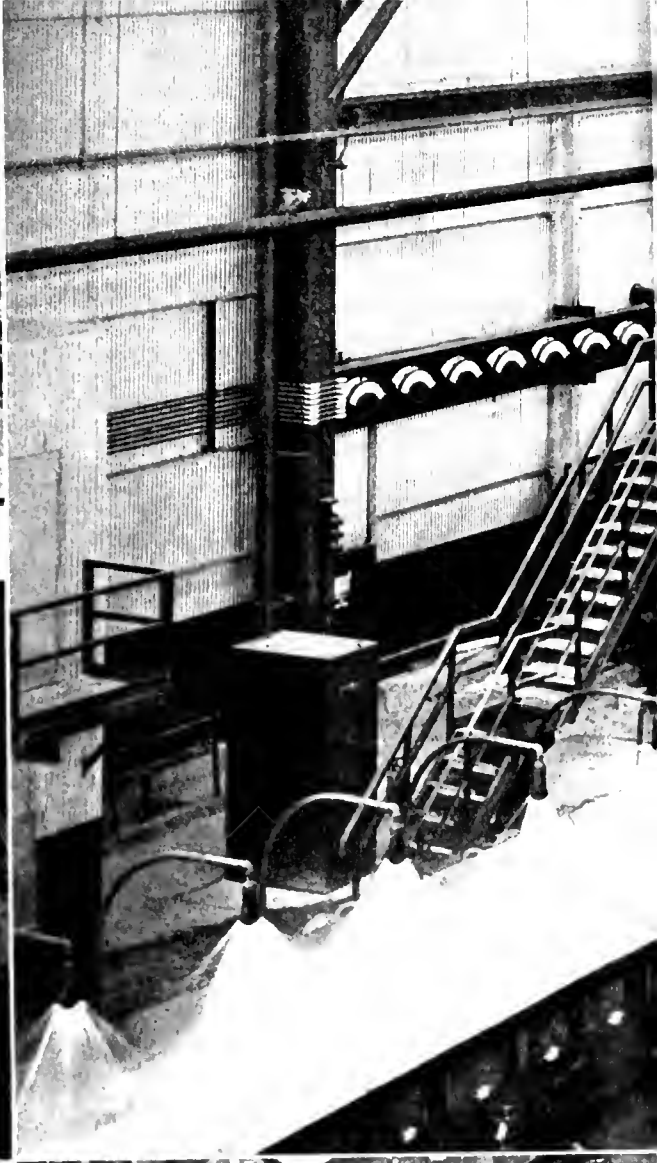
↓ Teeming (pouring) steel from ladle to ingot mold.

▲ The soaking pit, where ingots are reheated to rolling temperature.

▼ Stripping the mold from the ingot

↑ Charging slabs into a reheating furnace.

↓ Slabs ready for rolling into strip.



Plates, sheets, strip and tinplate are all rolled from slabs. In rolling strip, the slab is heated to correct rolling temperature and passed through a series of rolls which gradually reduce its thickness to the required gauge. From the final stand, the strip is either sheared and stacked, or coiled.

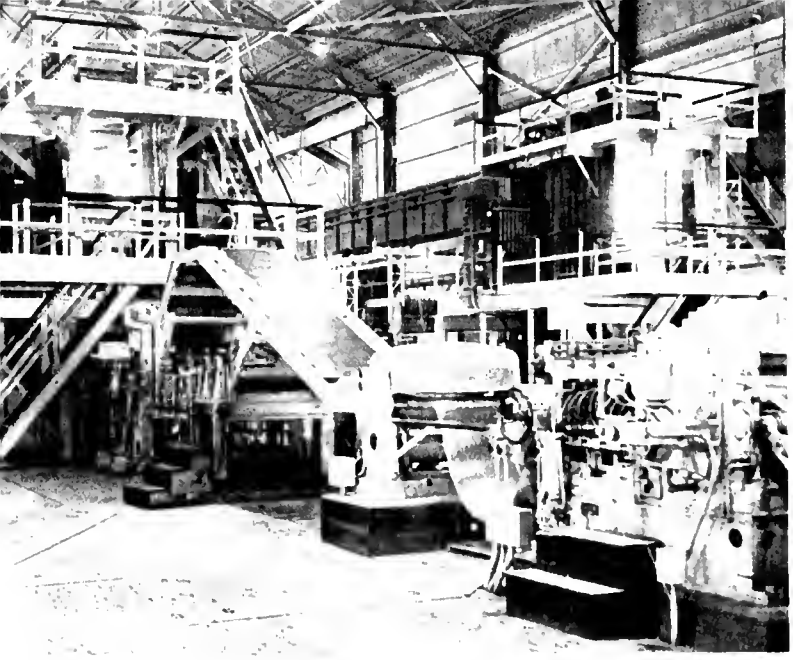
In the manufacture of tinplate, the steel is uncoiled, passed through a "pickling" solution which removes scale, and then recoiled. This strip steel may be cold reduced to as fine a measurement as six-thousandths of an inch. Because of stiffness in the steel that develops in the cold-reducing process, the steel is annealed after cleaning, cooled, and then passed through a temper mill. This mill re-imparts by pressure, without much reduction in gauge, a requisite amount of hardness or temper. At this point, the steel is either side trimmed and recoiled for electrolytic tinning or sheared for hot-dip tinning.

Gauging strip thickness at the hot-strip mill coiler. →

Finishing stands of a hot-strip mill.

In the cold-reduction process, cold steel under carefully controlled → processes is reduced to accurate tinplate and sheet thicknesses.

↓ The continuous pickler, where surface oxides are removed before cold reducing.



↑ Tin coating of strip by the electrolytic process.

Tinplate consists of a sheet of steel coated with tin—the amount depending upon the type of food or other product to be packaged. There are two methods of applying the tin: the electrolytic method, which consists of electroplating the steel with pure tin; and the hot-dip method, whereby the steel is passed through a bath of molten tin. Hot-dip tinplate is hand inspected by skilled women called "assorters," who examine each sheet. Electrolytic tinplate is automatically inspected by a series of electric-eye devices, which mechanically accept or reject the finished product.

↓ A tinplate assorter reflected in the product.

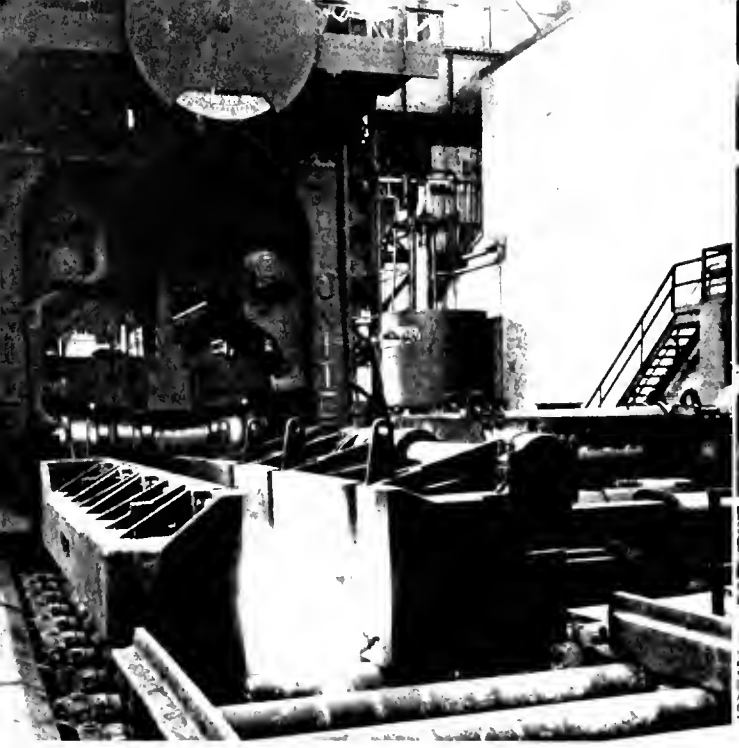
↓ Hot-dipped tinplate undergoing inspection.

↑ Shearing cold-reduced strip into sheets.

Sheets, generally, are larger, and of a heavier thickness than strip or tinplate. Depending upon eventual use of the material, sheets may be treated in many ways. Some, after hot rolling, receive only a shearing and leveling treatment. Some are cold-reduced like tinplate, annealed and temper rolled to a desired hardness. Various coatings may be applied, as in galvanized products. Special forms, such as circles, may be desired by the customer. Sheets may be processed in coils, or cut to length by a flying shear as they leave the hot mill and be handled as flat products. Some are pickled; some are oiled. Flatness is provided by stretcher or roller leveling. Whatever the process they have undergone, they are finally stamped, strapped, and wrapped for shipment to become automobile bodies, stoves, refrigerators, furniture and other products used in everyday living.

↑ Imparting temper to cold-reduced sheets by pressure rolling.

↓ In the roller leveler, sheets receive their final flattening.



↑ Rolling the bloom.

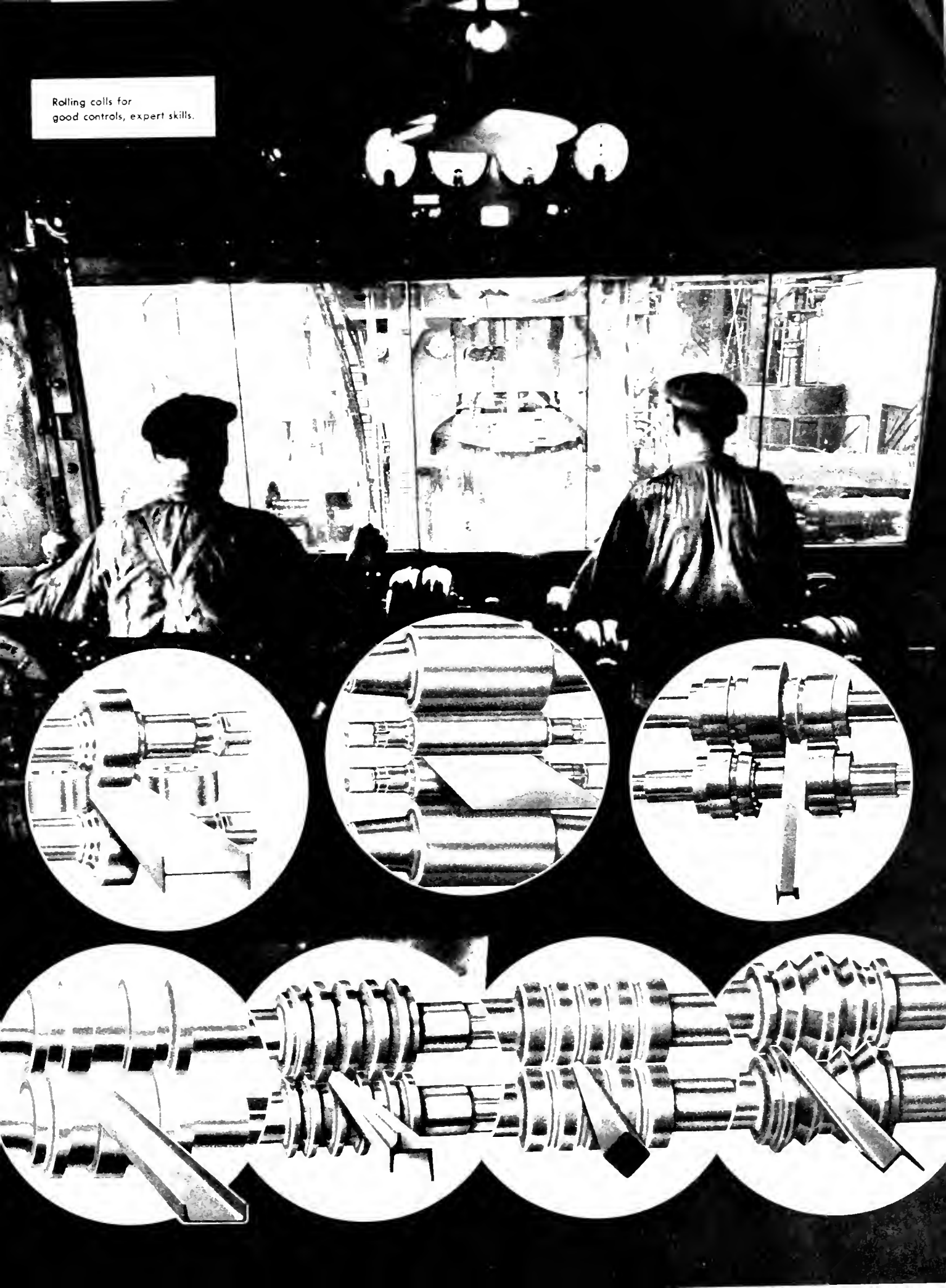
↑ Machining the flange of a railroad car wheel.

↓ Forging a railroad axle.

Producing steel in the many forms required by modern railroads requires a variety of processes and techniques. One of the oldest industrial arts known to man is the hammering of heated metals into useful or artistic forms. The blacksmith's skill is preserved today through men who handle the gigantic hammers that pound out steel axles for our modern railroads. The rough-forged axle acquires perfect roundness by machining on a lathe. Some products, such as wheels, are made by a combination of pressing and rolling, while rails are fashioned entirely by rolling. In all cases, the process is designed to produce a product uniquely suited to its own use, not only in shape and design, but in strength, toughness and endurance.

↓ Finished rails being loaded by magnet cranes.

Rolling coils for
good controls, expert skills.

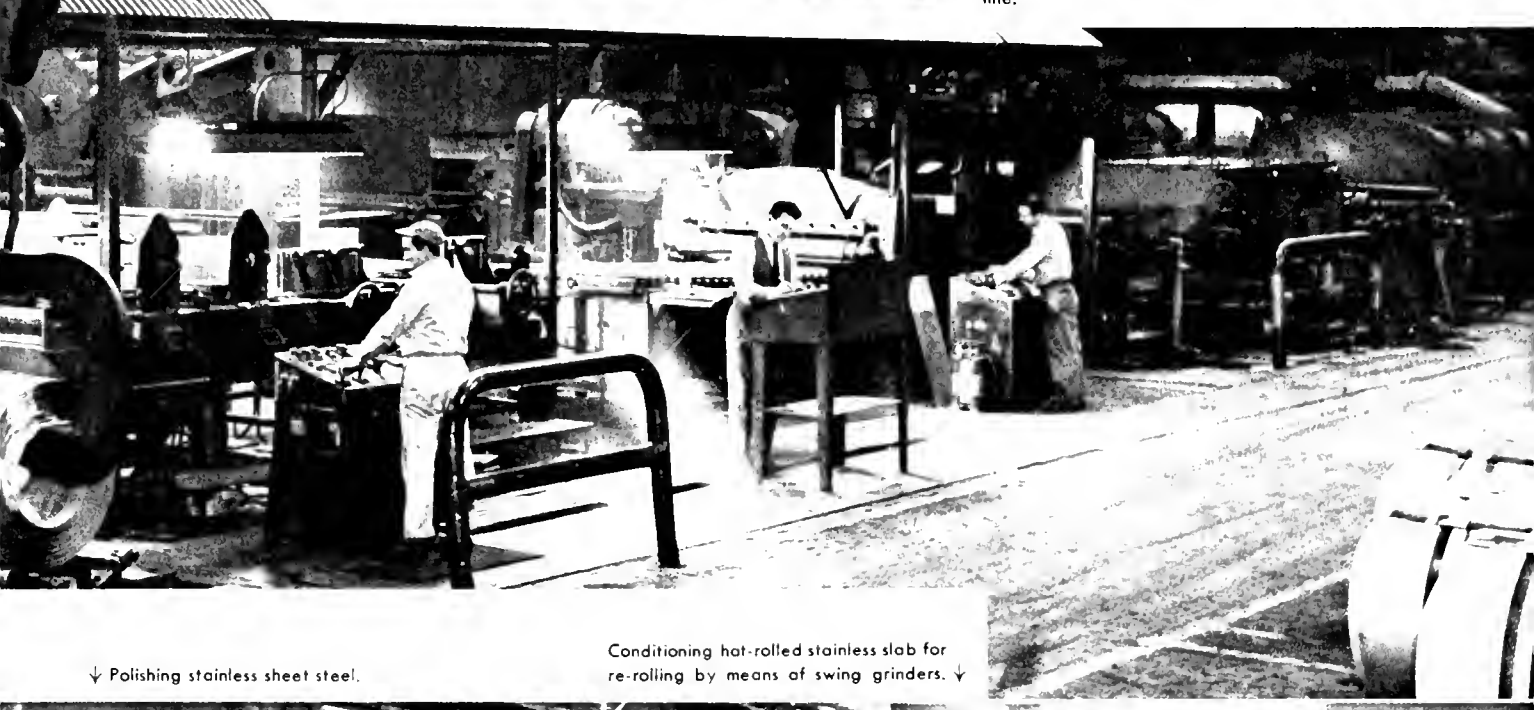


A versatile series of steels whose ingredients include iron and chromium, and usually nickel, are known as the "stainless" steels. These steels have remarkably great corrosion resistance because of the high percentage of chromium that is utilized.

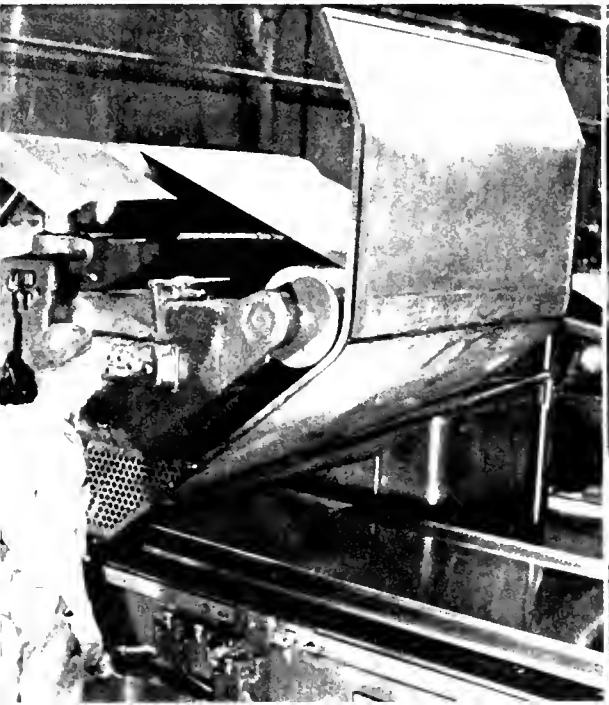
Stainless, which is made with great care in electric furnaces, requires the same precision processing in subsequent mill operations. Ingots, slabs and coils are carefully inspected, and any areas which contain surface defects are ground off before rolling or further processing is begun. Sheets and coiled strips are rolled at low speed. But this careful control which is exercised from start to finish assures users of a product which is virtually "tailor-made" for a special purpose.

← Stainless sheet steel moves through a continuous annealing furnace.

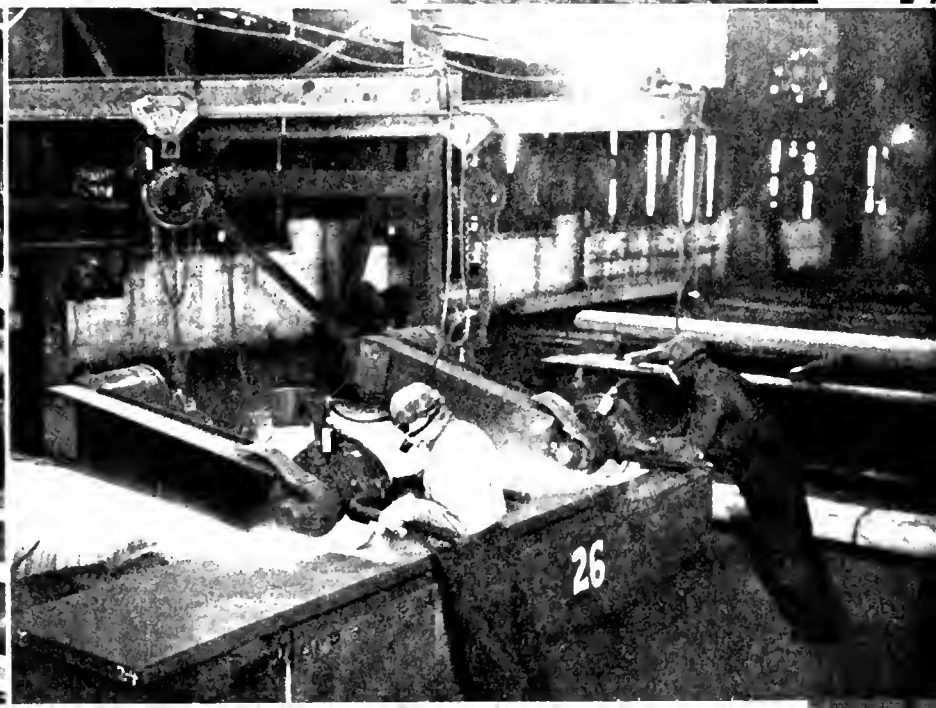
↓ Completing pickling and annealing on the stainless line.



↓ Polishing stainless sheet steel.

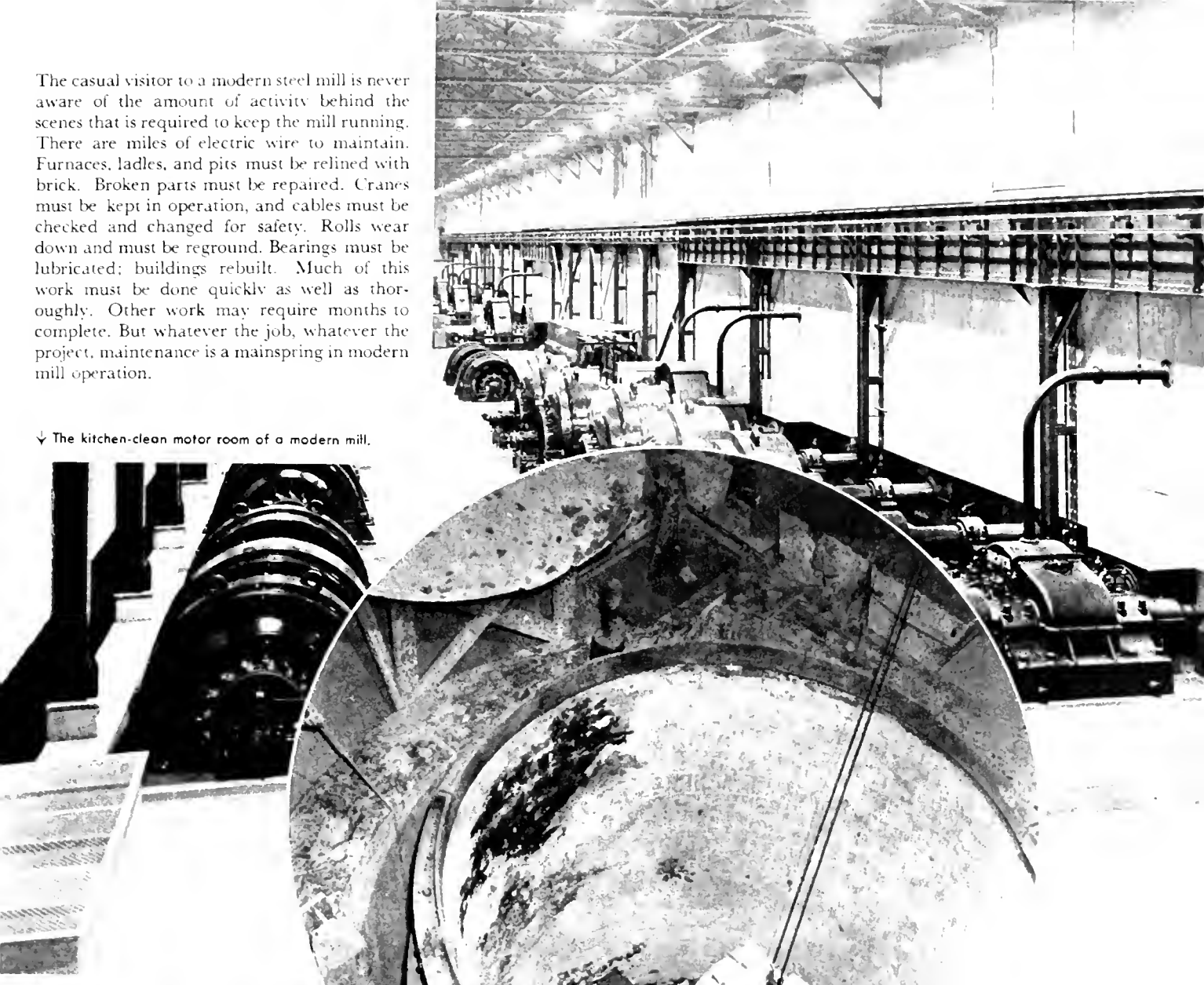


Conditioning hot-rolled stainless slab for re-rolling by means of swing grinders. ↓



The casual visitor to a modern steel mill is never aware of the amount of activity behind the scenes that is required to keep the mill running. There are miles of electric wire to maintain. Furnaces, ladles, and pits must be relined with brick. Broken parts must be repaired. Cranes must be kept in operation, and cables must be checked and changed for safety. Rolls wear down and must be reground. Bearings must be lubricated; buildings rebuilt. Much of this work must be done quickly as well as thoroughly. Other work may require months to complete. But whatever the job, whatever the project, maintenance is a mainspring in modern mill operation.

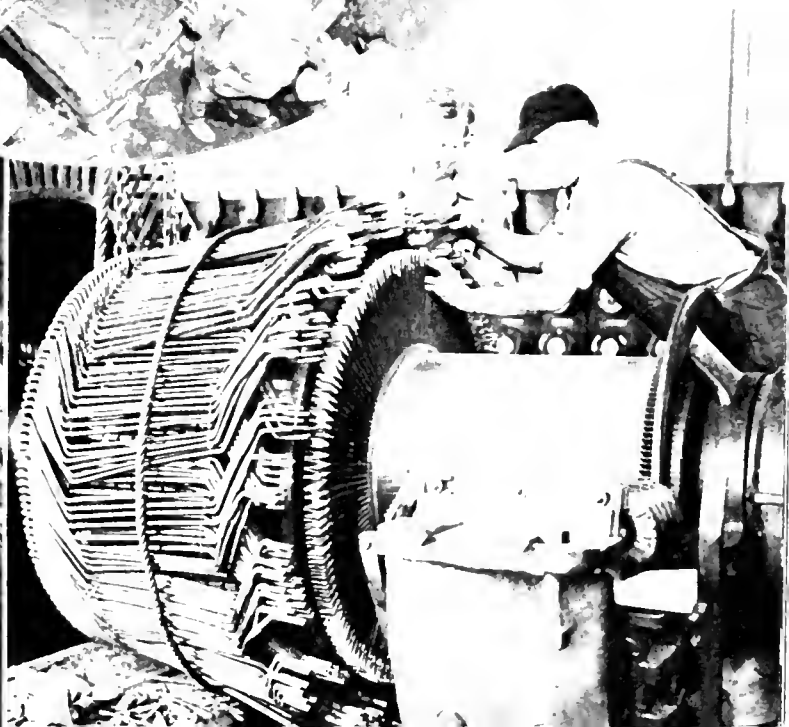
↓ The kitchen-clean motor room of a modern mill.

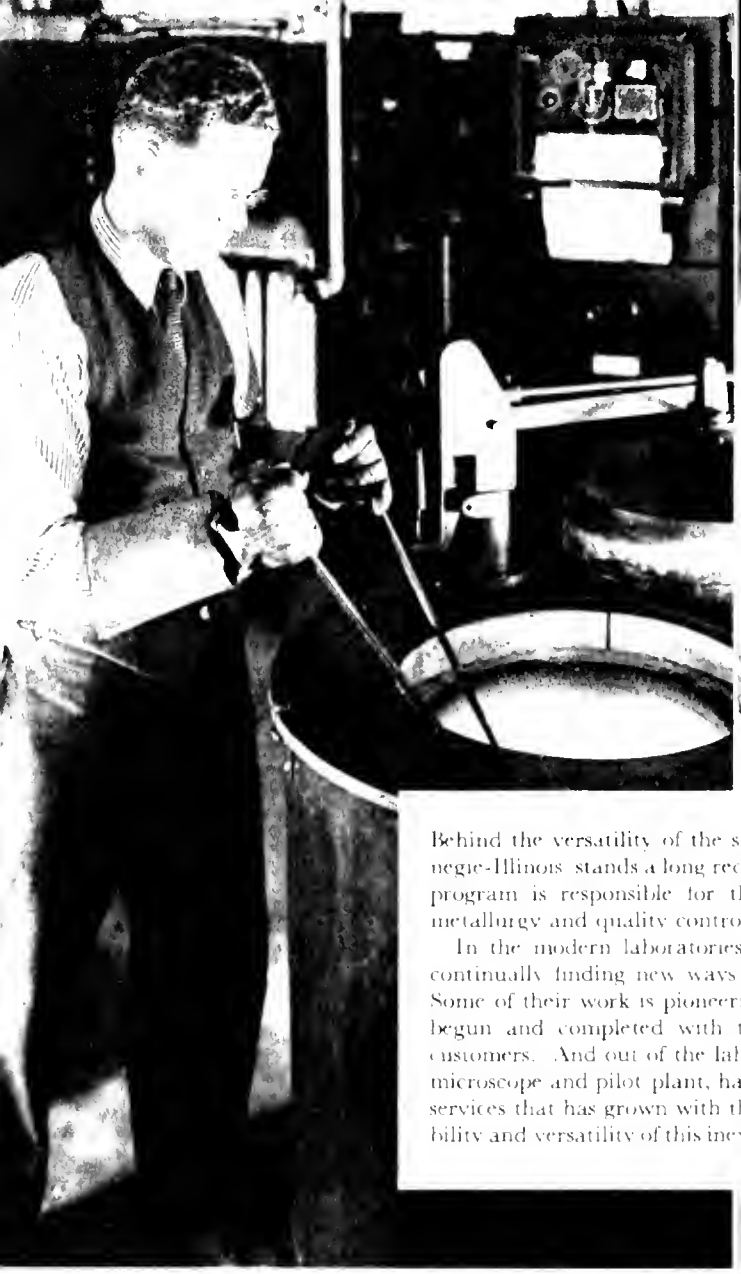


Relining a ladle with brick. →

↓ Welder on the job.

↓ Major repair on an electric motor.





Behind the versatility of the steels produced today in Carnegie-Illinois stands a long record of diligent research. This program is responsible for the rapid advances made in metallurgy and quality control.

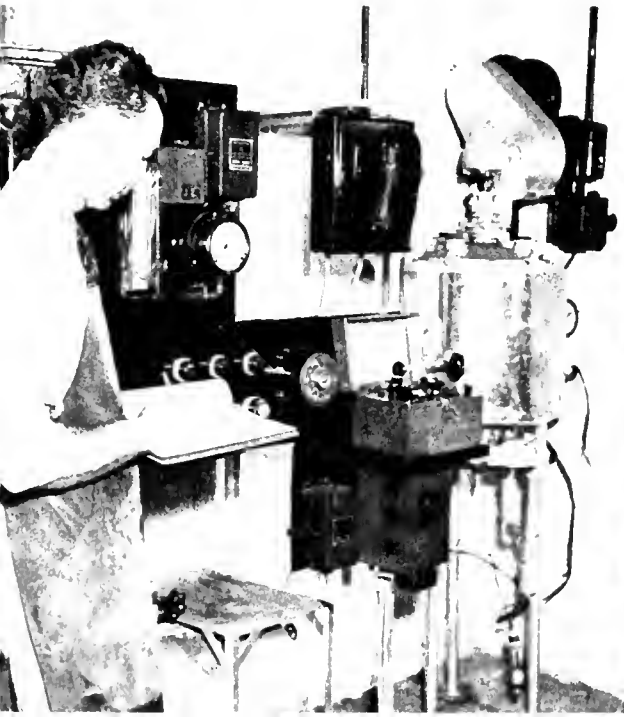
In the modern laboratories of today, research men are continually finding new ways for steel to serve the nation. Some of their work is pioneering. Other research tests are begun and completed with the cooperation of our steel customers. And out of the laboratories, from test tube and microscope and pilot plant, has come a list of products and services that has grown with the years, proving the adaptability and versatility of this inexpensive and abundant metal.

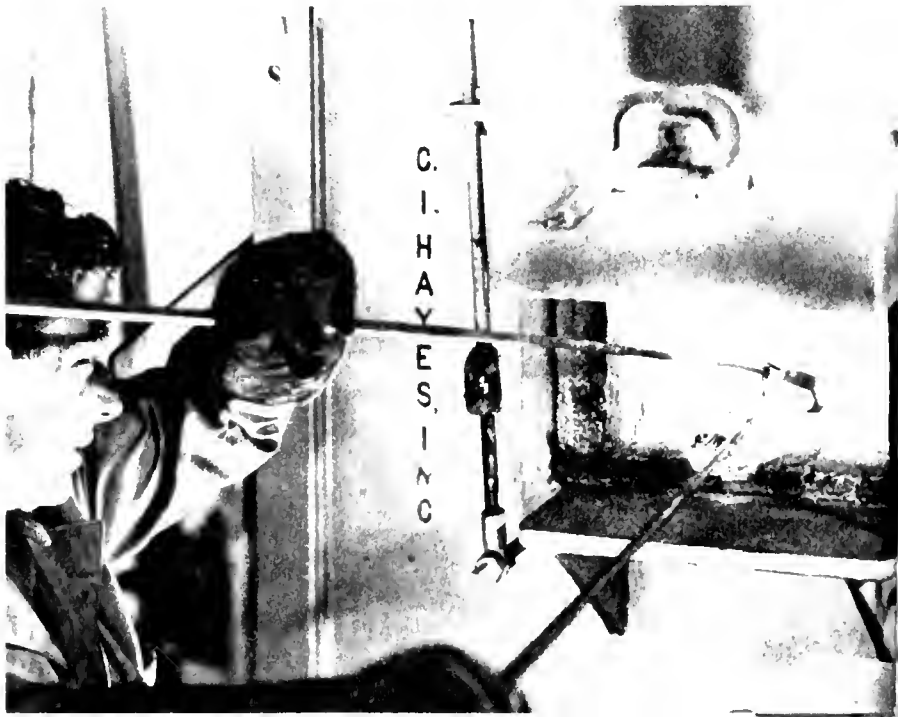
▲ Studying the effects of various heat treatments on steel.

▼ Careful records are kept of every test.

▲ Grain structure of steels are examined constantly.

▼ Running off a furnace test.





MAKERS OF STEEL

So FAR, you have followed the development of Carnegie-Illinois Steel Corporation in terms of history, equipment and techniques. We would now like to introduce to you the activities of the 100,000 men and women of Carnegie-Illinois—a representative cross-section of America. These men and women are offered, through their work, the chance to realize one of America's greatest promises—the opportunity for growth and self-development.

Our story has always been a story of growth—the growth of ideas as well as of physical property. This growth has depended upon the inter-relationship of all the members of Carnegie-Illinois. From this concept there has developed the broad policy framework for the individual employee that is designed to allow him as free a means of self-expression as possible throughout his job life with this company.

Let us consider that in most instances those who join the Carnegie-Illinois family do so without previous knowledge of steelmaking and the processes it involves. Few have considered the lines their future activity will take. That is why, from the moment they join the Carnegie-Illinois Steel Corporation, they come in contact with a planned policy of employee relations, which they may utilize to the full extent in aiding them in their own self-development in steel.

The interview—matching the man and the job.

His introduction to safety.

A handicapped veteran on his job.

Our company knows that when a man presents himself for employment, he's trying to prove something:—his worth. So the company gives the man all the help it can in the initial interview, processing and induction—and it also gives him some background about the company. This enables the employee to enter his job with confidence that he can find an adequate outlet for his own capabilities in terms of his special talents, or according to previous training he may have received elsewhere.

This is how the relationship begins between the new employee and Carnegie-Illinois.

Getting acquainted with the immediate family.

↑ Supervisory training covers the elements of supervision of men, processing of material, and principles of leadership.

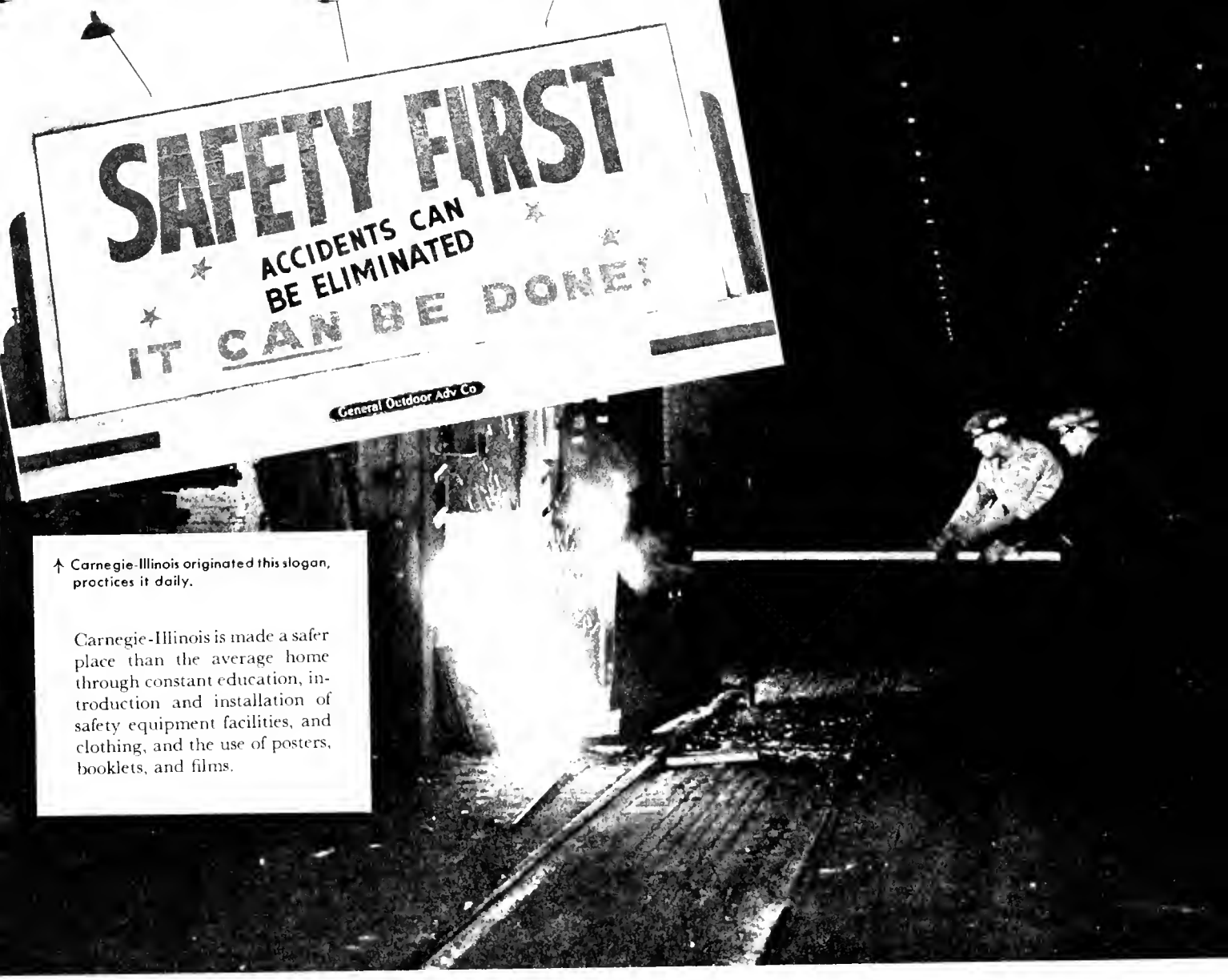
Learning a trade through apprentice training. ↗

The means for acquiring the knowledge necessary for the employee to perform creditably on his present job, and to progress in the company, is provided by a versatile training program. Training in Carnegie-Illinois is adapted to the various needs of the employee. More specifically, this training—given through actual experience on the job, or through specialized training techniques whereby he gains a more intimate knowledge of the specific duties to which he might be assigned—gives the employee an opportunity to express himself to his best ability in any given job assignment.

Acquiring the fundamentals of → "on-the-job" training.

↓ Education through visual aids.

A graduate work-in-industry class. ↓



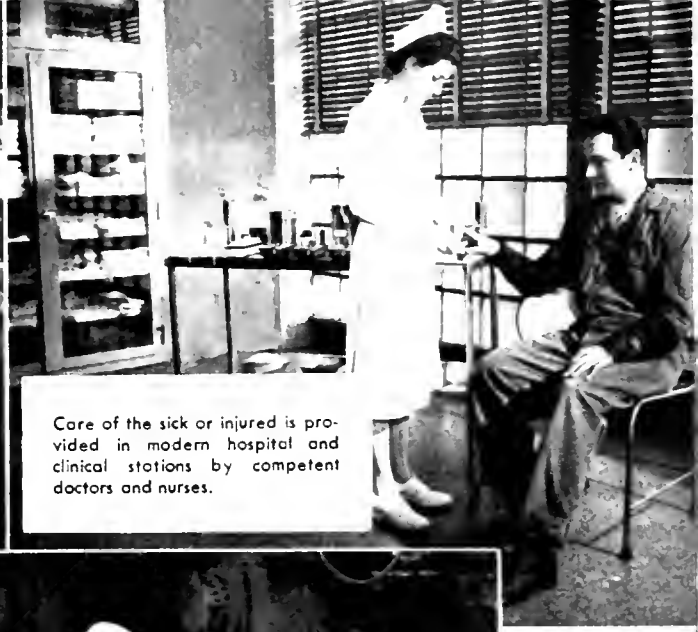
↑ Carnegie-Illinois originated this slogan, practices it daily.

Carnegie-Illinois is made a safer place than the average home through constant education, introduction and installation of safety equipment facilities, and clothing, and the use of posters, booklets, and films.

↑ Mechanical safeguards are a "must" in the mills.

↓ Good foremanship—encouraging safety.

↓ An employee is fitted for safety shoes.

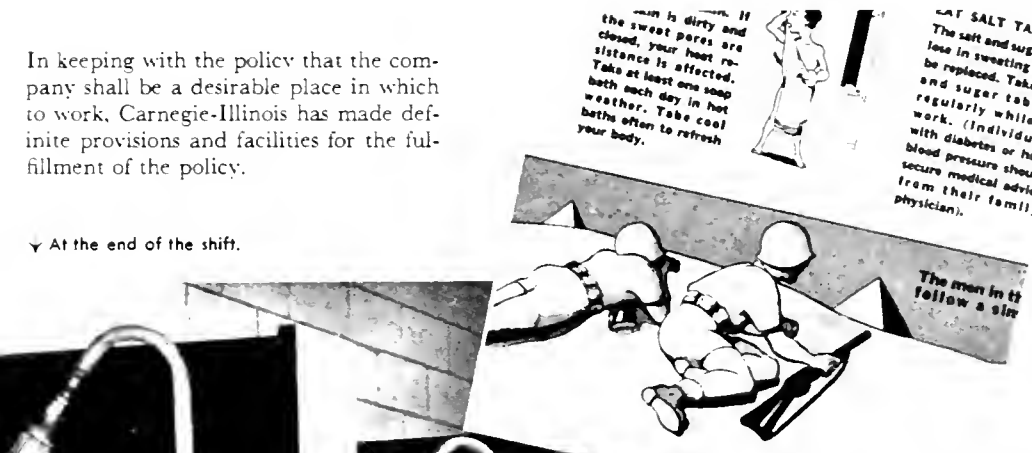


Care of the sick or injured is provided in modern hospital and clinical stations by competent doctors and nurses.

^ Canteen service around the clock.

^ Seldom used, but "just in case . . ."

In keeping with the policy that the company shall be a desirable place in which to work, Carnegie-Illinois has made definite provisions and facilities for the fulfillment of the policy.



Learning to beat the common ailments.

Help Yourself Beat the Gun on Cold

My fellow Germs I'm here today
To get a program under way
The Board for Bigger Better Bugs
Has sent me out to teach you lugs
My first name's Mike, the last is Krobe
And everywhere around the globe
Bacteria, Incorporated
With whom I am

↑ This band has brought good music to many audiences.

From the companionship developed during the working hours in Carnegie-Illinois have come numerous clubs and societies which express the variety of employee interests, and through which close and lasting friendships have been formed. In the field of music alone, many of these organizations have gained national recognition for their work, and all are respected and appreciated in the communities in which they are active either in certain seasons or throughout the year.

← Christmas carols by an employee group

↓ A Carnegie-Illinois chorus (right) on the "USS Theater Guild" broadcast

↑ A "close one" in softball.

↑ On the links, after work.

↓ Strikes, spares and splits.

Good times for children . . .

↓ . . . in summer camps.

↓ . . . at parties.

↑ Another stone in the foundation of the future.

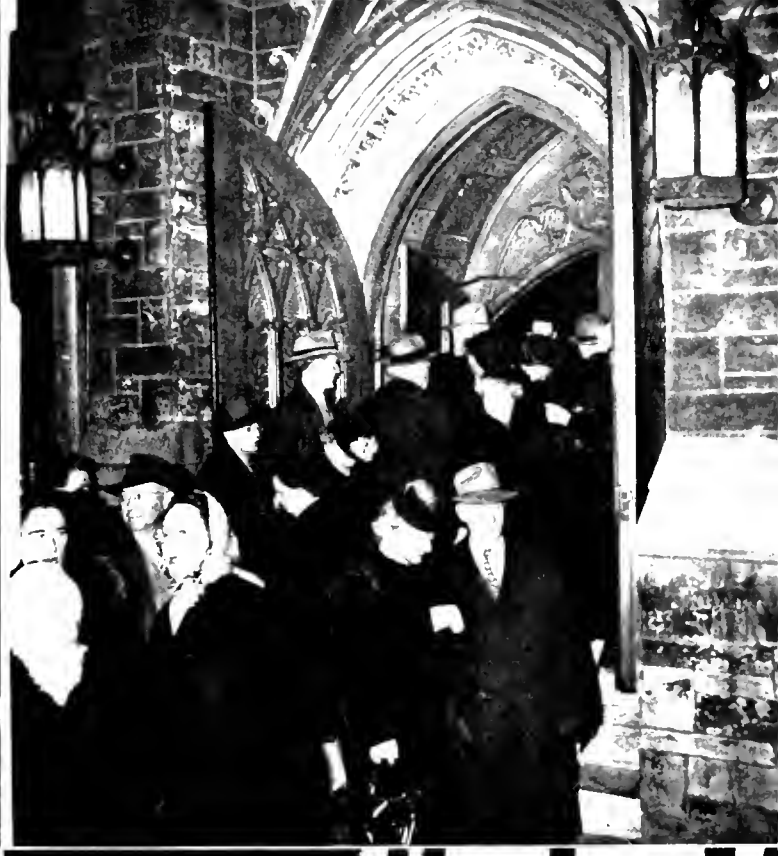
↑ The arrival of this new king was in part provided for by group hospitolization.

← Group insuronce for those who wish it.

The people of Carnegie-Illinois have bolstered their own future by initiation or participation in protective measures designed to cushion any shock of personal emergencies as well as to provide sources for their future income.

← Looking back over more than four decades of service

↑ . . . in his home.



. . . in his church. ↗

This company has always recognized that an employee's relationship between his community life and his industrial environment is inseparable. Consequently, it has encouraged full expression to every practicable effort in the many constructive activities of employees that are identified with the pattern of community progress. The interest and talent that a man brings to the making of steel in Carnegie-Illinois are therefore reflected in the community in which he lives. You will find him and his family to be good members of that community, and leading a full community life . . .

↑ . . . . in worthwhile community causes.

↓ . . . in family outings.

↓ . . . and represented by his children in the schools.

OUR PRODUCING UNITS

PITTSBURGH DISTRICT

Clairton Works	Clairton, Pa.
Isabella Furnaces of Clairton Works	Etna, Pa.
Duquesne Works	Duquesne, Pa.
Edgar Thomson Works	Braddock, Pa.
Homestead District	Munhall, Pa.
Homestead Works	Homestead, Pa.
Carrie Furnaces	Rankin, Pa.
Wheel & Axle Division	McKees Rocks, Pa.
Irvin Works	Dravosburg, Pa.
Vandergrift Plant of Irvin Works	Vandergrift, Pa.
Johnstown Lorain Works	Johnstown, Pa.
Roll and Machine Works	Canton, Ohio
Wood Works	McKeesport, Pa.
Youngstown District	
Ohio Works	Youngstown, Ohio
McDonald Mills	McDonald, Ohio
Upper Union Mills	Youngstown, Ohio

CHICAGO DISTRICT

Gary Sheet & Tin Mill	Gary, Indiana
Gary Steel Works	Gary, Indiana
Joliet Works	Joliet, Illinois
South Works	Chicago, Illinois

WHAT WE PRODUCE

STEEL—CLASSES AND KINDS

CARBON: Open Hearth and Bessemer

ALLOY: Open Hearth and Electric Furnace

U·S·S· Stainless and Heat Resisting Steels

U·S·S· High Strength Steels

ROLLED, FORGED, AND CAST STEEL PRODUCTS

SEMI-FINISHED PRODUCTS

Ingots, Blooms, Billets, Slabs, Skelp.

FURNACE PRODUCTS

Pig Iron, Ferro-Manganese

BAR MILL PRODUCTS

Rounds, Half Rounds, Squares, Ovals, Half Ovals, Hexagons, Flats, Angles, Curb Angles, Channels, Tees, Zees, Special Sections, U·S·S· Concrete Reinforcing Bars.

STRUCTURAL MILL PRODUCTS

CB Sections, U·S·S· Steel Bearing Pile Sections, U·S·S· Steel Sheet Piling, Standard and Light Beams, Channels, Angles, Tees, Zees, Car and Shipbuilding Shapes.

PLATE PRODUCTS

Sheared and Universal Mill Plates for All Purposes, Heavy Plates for Machinery Construction and for Column Base Plates, U·S·S· Multigrip Floor Plates, Yoder Mill Shapes, Isherwood Sections.

ARMOR PLATE

Rolled and Forged

SHEET MILL PRODUCTS

U·S·S· Hot Rolled and Hot Rolled Pickled Sheets, U·S·S· Cold Rolled Sheets, U·S·S· Hollowware Enameling Sheets, U·S·S· Galvanized (Flat and Formed) Sheets, U·S·S· Electrical Sheets and Other Grades, U·S·S· Vitrenamel Sheets, U·S·S· Copper Steel and U·S·S· Pure Iron Sheets, U·S·S· Long Terne Sheets, U·S·S· Culvert Sheets, U·S·S· High Strength Steel Sheets.

STRIP MILL PRODUCTS

U·S·S· Hot Rolled and Hot Rolled Pickled Strip, Slack Barrel, Tobacco Hogshead, and Tight Barrel Hoop.

TIN MILL PRODUCTS

U·S·S· Ferrostan, Coke and Charcoal Tin Plate, Can Making Quality Black Plate, Holloware Enameling Black Plate, Manufacturing Ternes, Special Coated Manufaturing Ternes, Roofing Short Ternes.

STAINLESS STEEL PRODUCTS

U·S·S· Stainless and Heat-Resisting Sheets, Plates, Bars, Angles, Forgings, and Semi-Finished Material.

RAILROAD AND RAILWAY TRACK PRODUCTS

Standard and Light Rails, Splice Bars, Tie Plates, Riser Plates, Special Track Work and Accessories, including Frogs, Crossings and Switches.

FABRICATED PRODUCTS

Steel Mine Timbers, Steel Sheet Piling, U·S·S· I-Beam Lok, Bridge Flooring, Industrial and Mine Cars, Steel Cross Ties for Mine and Portable Track, Mine Jacks, Grinding Mill Liner Plates, Locomotive Side Frames, Coke Oven Doors and Jambs.

WROUGHT AND FORGED PRODUCTS

Wheels and Axles for Steam, Electric and Industrial Service, Miscellaneous Circular Sections, Heavy Forgings, Forged Steel Grinding Balls.

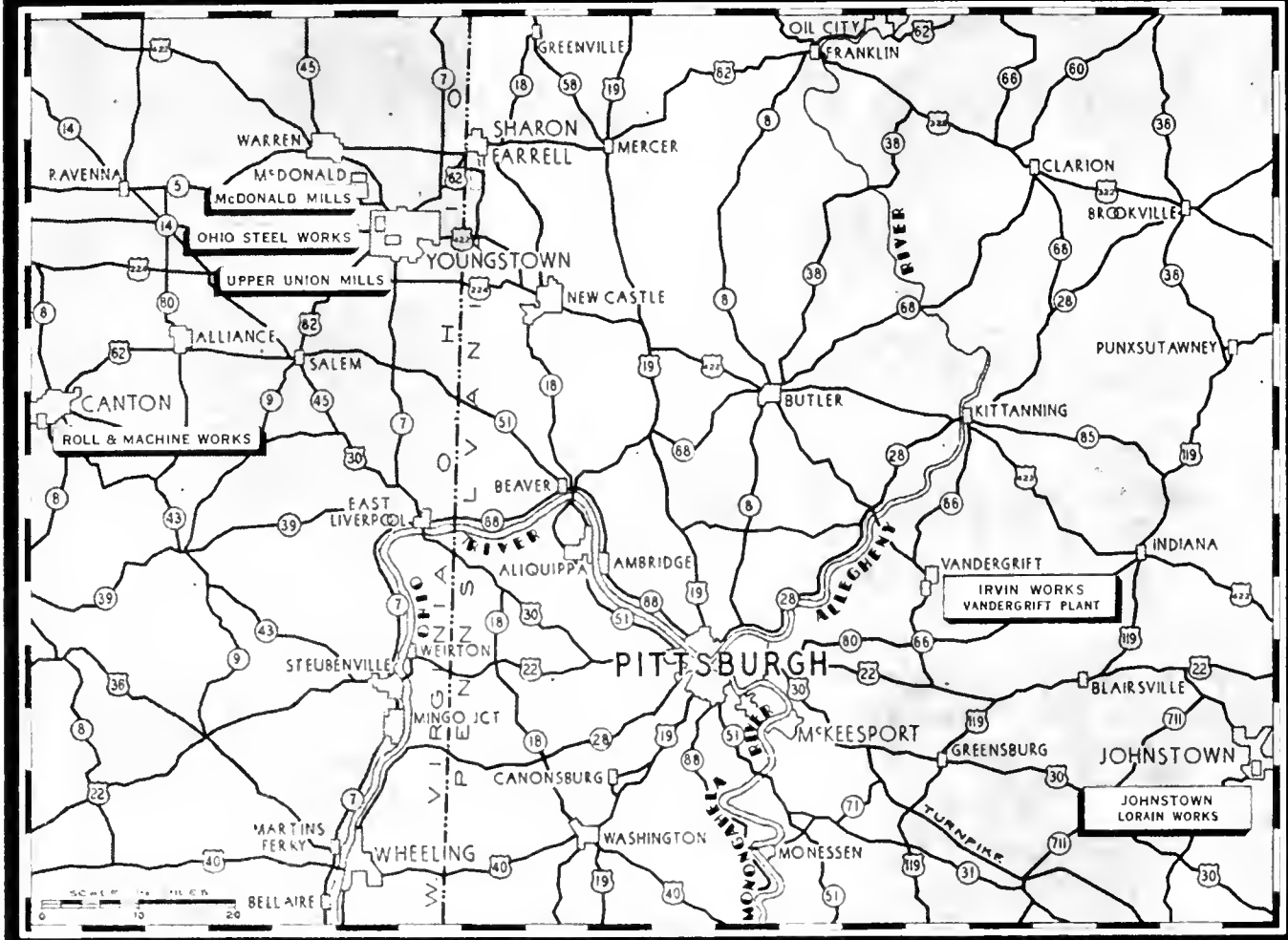
CAST PRODUCTS

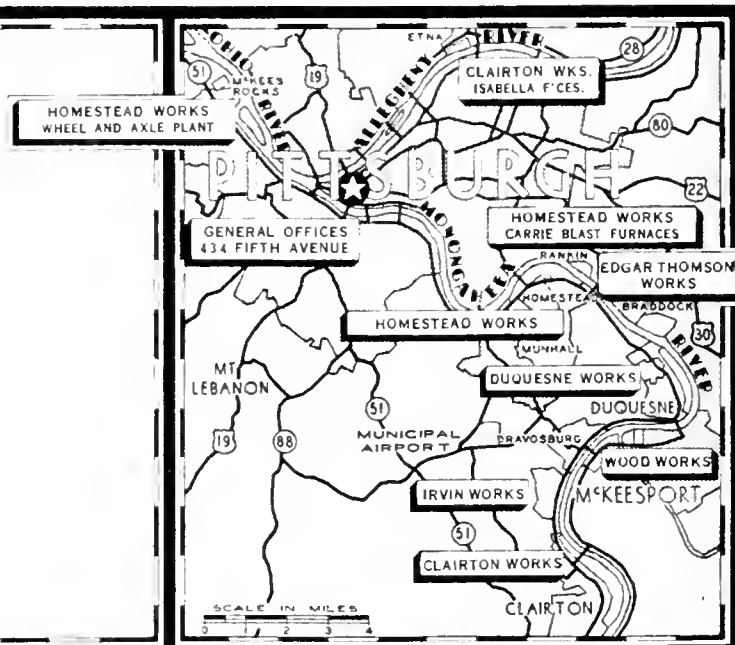
Carbon, Manganese and Alloy Steel Castings, Grey Iron Castings.

BY-PRODUCTS

Tar, Coal Chemicals, Air-Cooled Crushed and Screened Slag, Water Granulated Slag, Converter Mill Slag, Open Hearth Slag, Boiler House Cinders.

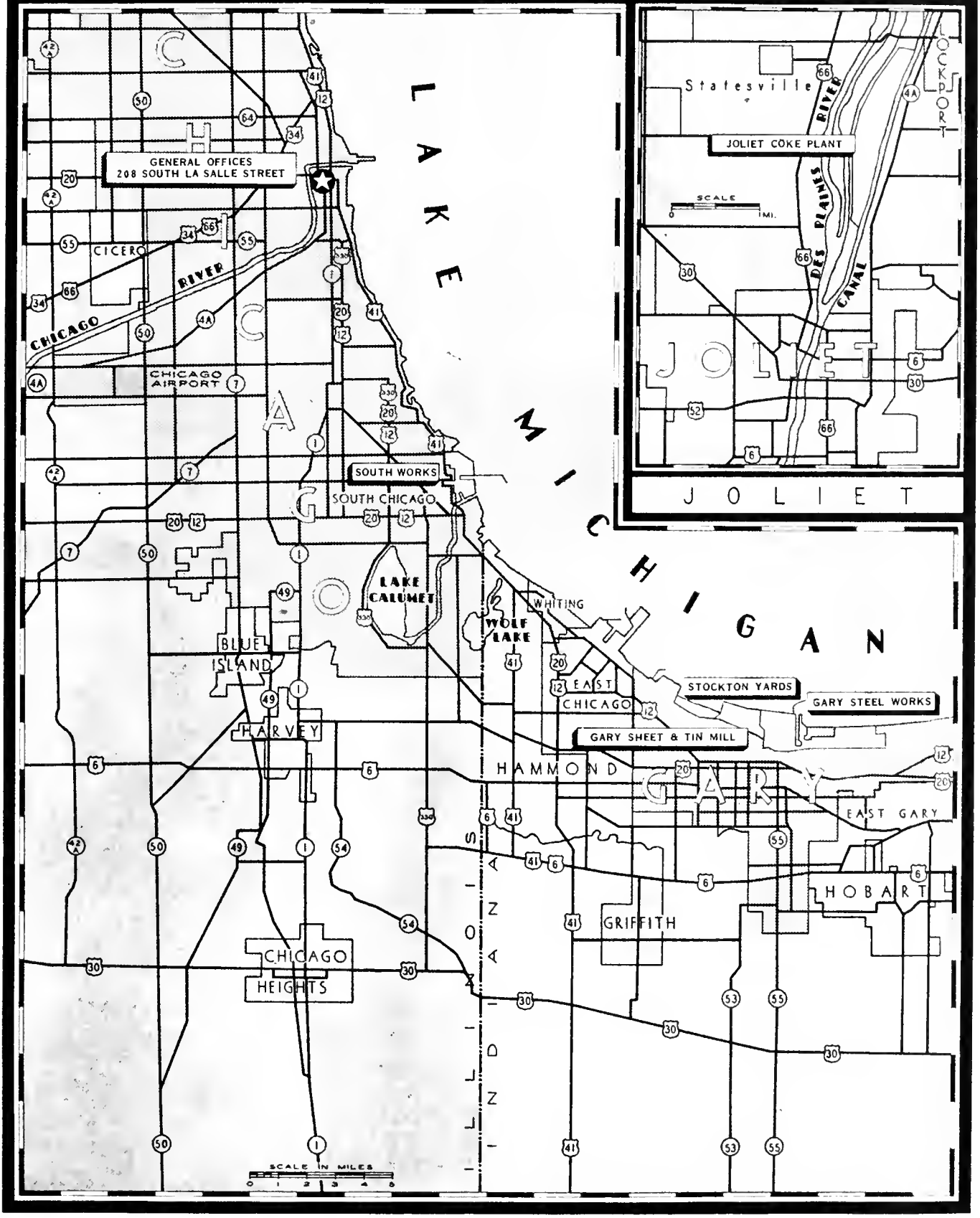
PITTSBURGH DISTRICT





PITTSBURGH

CHICAGO DISTRICT



THIS is the end of your book on the story of steel in Carnegie-Illinois. But it is only the book that has ended.

For our story of steel will go on.

Our name is bound up with America's past, and you have read a brief account of that past. You have read about the equipment and techniques that we use today in our company to make steel and allied products. And we have told you something of the way we work together and the plans we have made for our future.

Our hopes for this future are not novel hopes. They are common to all countrymen of the United States. We want a future that will give all of us a high standard of living, as well as a new breadth of wisdom that will enable us to enjoy intelligently the fruits of our own labors.

In brief, we want an American future.

And to that end, the 100,000 men and women of Carnegie-Illinois pledge their energies, their knowledge, their skills and their talents to give a high standard of service to the nation in the years that lie ahead.

CARNEGIE-ILLINOIS STEEL CORPORATION

GENERAL OFFICES

434 Fifth Avenue, Pittsburgh 30, Pa.

DISTRICT SALES OFFICES

BOSTON, MASS.
BUFFALO, N. Y.
CHICAGO, ILL.
CINCINNATI, OHIO
CLEVELAND, OHIO
DENVER, COLO.
DETROIT, MICH.
INDIANAPOLIS, IND.
MILWAUKEE, WIS.
NEW YORK, N. Y.
PHILADELPHIA, PA.
PITTSBURGH, PA.
ST. LOUIS, MO.
ST. PAUL, MINN.
WASHINGTON, D. C.

DISTRICT SALES SUB-OFFICES

BALTIMORE, MD.
COLUMBUS, OHIO
HARTFORD, CONN.
KANSAS CITY, MO.
TOLEDO, OHIO
YOUNGSTOWN, OHIO

RESIDENT REPRESENTATIVES

BLUEFIELD, W. VA.
DAYTON, OHIO
DES MOINES, IOWA
GRAND RAPIDS, MICH.
LOUISVILLE, KY.
MOLINE, ILL.
PARKERSBURG, W. VA.
PEORIA, ILL.
RICHMOND, VA.
ROCHESTER, N. Y.
SYRACUSE, N. Y.
WILKES-BARRE, PA.

USS